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# THE EX-DIVIDEND PERIOD STOCK PRICE BEHAVIOR IN FINLAND DURING 2003–2014

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# TABLE OF CONTENTS

page

**1. INTRODUCTION** 9

**2. DIVIDEND THEORY** 12

2.1. Dividends and shareholder's wealth 14

2.2. Dividends and the stock price 17

2.3. Dividend taxation 26

2.4. Dividends in Finland 30

**3. LITERARY REVIEW** 35

3.1. The ex-dividend day stock price behavior 35

3.2. The ex-dividend period anomaly 41

3.3. Demand for dividends 42

**4. DATA AND METHODOLOGY** 44

4.1. The data 44

4.2. The methodology 48

**5. EMPIRICAL RESULTS** 55

5.1. The ex-dividend day stock price behavior 55

5.2. The ex-dividend period anomaly 65

5.2.1. Test statistics 66

5.2.2. The ex-dividend period abnormal returns 70

**6. CONCLUSIONS** 86

**REFERENCES** 88

## LIST OF FIGURES page

**Figure 1.** Dividend growth and present values of stock price components. 19
**Figure 2.** The effect of return on retained earnings on stock price. 20
**Figure 3.** Effect of retained earnings ratio and return on assets on stock price. 22
**Figure 4.** Stock price as function of retained earnings ratio and return on assets. 24
**Figure 5.** Annual dividend yields and average cash dividend 2003–2014. 46
**Figure 6.** OMX Helsinki Benchmark Growth Index performance 2003–2014. 47
**Figure 7.** 3 month and 12 month EURIBOR interest rates for 2003–2014. 47
**Figure 8.** Event-study general timeline. 50
**Figure 9.** UPM-Kymmene stock price and market index 2001–2014. 52
**Figure 10.** UPM-Kymmene $\alpha$ and $\beta$ using 120 and 250 observations 2001–2014. 52
**Figure 11.** Kemira 2010 ex-dividend period stock price behavior and coinciding market volatility. 58
**Figure 12.** Ex-dividend period abnormal returns 2003–2014. 71
**Figure 13.** Ex-dividend period daily average abnormal return volatility 2003–2014. 72
**Figure 14.** Comparison of parametric and nonparametric test statistics. 73
**Figure 15.** Ex-dividend period abnormal returns high yield 2003–2014. 74
**Figure 16.** Ex-dividend period abnormal returns low yield 2003–2014. 75
**Figure 17.** Ex-dividend period abnormal returns high yield 2003–2004. 76
**Figure 18.** Ex-dividend period abnormal returns low yield 2003–2004. 77
**Figure 19.** Ex-dividend period abnormal returns high yield 2005–2008. 78
**Figure 20.** Ex-dividend period abnormal returns low yield 2005–2008. 79
**Figure 21.** Ex-dividend period abnormal returns high yield 2009–2011. 80
**Figure 22.** Ex-dividend period abnormal returns low yield 2009–2011. 81
**Figure 23.** Ex-dividend period abnormal returns high yield 2012–2014. 82
**Figure 24.** Ex-dividend period abnormal returns low yield 2012–2014. 83

## LIST OF TABLES **page**

**Table 1.** Taxes in Finland 2003–2014. 28

**Table 2.** Average household capital income 2003–2013. 30

**Table 3.** The stocks included in the study. 45

**Table 4.** Price drop ratios by stocks. 57

**Table 5.** Price drop ratios by dividend yields. 59

**Table 6.** Price drop ratios by year. 60

**Table 7.** Tax indifferent price drop ratios with minimum deductions 2003–2014. 62

**Table 8.** Tax indifferent price drop ratios with maximum deductions 2003–2014. 63

**Table 9.** Statistical properties of price drop ratios. 64

**Table 10.** Ex-dividend period abnormal returns 2003–2014. 71

**Table 11.** Ex-dividend period abnormal returns high yield 2003–2014. 74

**Table 12.** Ex-dividend period abnormal returns low yield 2003–2014. 75

**Table 13.** Ex-dividend period abnormal returns high yield 2003–2004. 76

**Table 14.** Ex-dividend period abnormal returns low yield 2003–2004. 77

**Table 15.** Ex-dividend period abnormal returns high yield 2005–2008. 78

**Table 16.** Ex-dividend period abnormal returns low yield 2005–2008. 79

**Table 17.** Ex-dividend period abnormal returns high yield 2009–2011. 80

**Table 18.** Ex-dividend period abnormal returns low yield 2009–2011. 81

**Table 19.** Ex-dividend period abnormal returns high yield 2012–2014. 82

**Table 20.** Ex-dividend period abnormal returns low yield 2012–2014. 83

**Table 21.** Sub-period abnormal return signs. 84

**Table 22.** Sub-period abnormal returns. 85

**Table 23.** Test statistic performance. 85

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## ABSTRACT

The purpose of this thesis is to examine the ex-dividend period stock price behavior on the Finnish stock market during 2003–2014. The data consists of 269 ordinary and extra ex-dividend periods of 24 stocks traded on the Helsinki Stock Exchange. The time period of the study contains the financial crisis of 2007–2009 and several changes in the capital income tax legislation affecting both dividend and capital gains taxation. Event-study methodology is applied to analyze the ex-dividend period stock price behavior.

Previous studies have shown the ex-dividend day stock price drop to be less than the dividend. However for high dividend yield stocks the price drop has been reported to be greater than the dividend. The first part of this thesis investigates the ex-dividend day stock price drop and it's characteristics on the Finnish stock market during 2003–2014. This study confirms the presence of an ex-dividend day stock price drop less than the dividend for low dividend yield stocks and a stock price drop greater than the dividend for the highest dividend yield stocks. For medium dividend yield stocks the stock price drop was statistically indistinguishable from 1.

The second part of this thesis investigates the presence of abnormal returns in the ex-dividend period. Several studies have detected positive abnormal returns shortly before the ex-dividend day and negative abnormal returns immediately after. The ex-dividend period examined was ±20 trading days around the ex-dividend day. Abnormal returns were detected on the 5-day periods immediately before and after the ex-dividend day, on the ex-day itself and on the 5-day period staring 16 days after the ex-day. The returns were more pronounced when high and low dividend yield stocks were examined separately. The presence of abnormal returns on the ex-dividend day supported the findings in the first part of the study. High dividend yield stocks had negative abnormal returns on the ex-day corresponding with the stock price falling more than the amount of the dividend. The abnormal returns on the ex-day for the low yield stocks were positive and consistent with the observed ex-day stock price drop of less than the dividend amount.


**KEYWORDS:** Ex-dividend, ex-day, abnormal return, event-study.

# 1. INTRODUCTION

The purpose of this thesis is to examine stock price behavior around cash dividend distributions of shares traded on the Helsinki Stock Exchange during 2003–2014. The ex-dividend date, the first day the shares trade without the right to the dividend, is known in advance and the dividend amount is highly predictable prior to the ex-dividend date. The time period immediately before and after the ex-dividend date is referred to as the ex-dividend period. Abnormal returns during the ex-dividend period leading up to the ex-dividend date are assumed to reflect shareholders' preference or aversion towards the cash dividend. If the shareholders prefers not to receive the dividend they need to sell the shares when they still trade cum-dividend, with the right to the dividend, before the ex-dividend date and conversely anyone preferring to receive the dividend must buy the shares before the ex-dividend date. This dividend aversion is expected to cause negative abnormal returns and dividend preference is expected to cause positive abnormal returns during the ex-dividend period (Kalay & Lemmon 2008: 11–21).

Important factor affecting the attractiveness of cash dividends during the ex-dividend period is taxation. When capital gains are not taxed equally with respect to cash dividends there exists an opportunity to minimize taxes by preferring cash dividends or capital gains. Capital income tax is also affected by the amount of deductions such as interest payments on certain loans or capital losses from current and previous years. The past market returns therefore also contribute to the tax differential of dividends and capital gains. Receiving a dividend while incurring a capital loss larger than the dividend is in certain cases profitable. Due to the differential taxation the opposite is true when a loss occurs even when the ex-dividend stock price falls less than the dividend amount.

The time period covered by this thesis contains four periods of differing relative taxation of cash dividends and capital gains. In Finland the cash dividend is paid out directly to bank account associated with the shareholder's book-entry account. This is far more convenient and cost effective than replicating the cash flow from dividends by selling a corresponding proportion of shares. This is another factor increasing the attractiveness of cash dividends. On the other hand cash dividends are taxed immediately whereas capital gains and losses are realized when the assets are sold. This enables deferring of the capital gains tax lowering its present value. The option to time realization of capital gains and losses has value to the investor as shown by Constantinides (1983).

Maximizing shareholder's wealth should be the objective for any firm. Every decision should be based on maximizing the shareholder value including the decision of distributing earnings as cash dividends (Gordon & Shapiro 1956: 103–104). A cash dividend per se does not increase shareholder's wealth, on the contrary, as long as there are costs and taxes associated with dividend distributions a fraction of shareholder's wealth is lost. The subjectively perceived opportunity cost of not having the cash dividend is another factor in deciding whether or not the loss of wealth associated with dividend distributions is acceptable. Behavioral finance explains the demand for dividends through mental accounting of different assets and incomes. Dividends conveniently transfer savings capital into disposable income which is preferable to certain investors.

Two questions regarding cash dividends are examined. First concerns the value of the dividend. This question is investigated by analyzing the ex-dividend day stock price behavior. In a perfect market if a firm pays a 1€ dividend the stock price should fall by 1€ per share. The first research hypothesis therefore is:

$H_1$: *The stock price falls on ex-dividend day by an amount equal to the dividend.*

The second question is whether dividends are considered to increase or decrease investor's wealth. Examining the stock price behavior before the ex-dividend day is assumed to indicate investors' preferences regarding dividends. Again assuming perfect markets, rational investors and firms applying optimal dividend policies, the ex-dividend day should have no effect on shareholder's wealth and therefore no effect on the stock price. The second research hypothesis therefore is:

*$H_2$: Abnormal returns are zero during the ex-dividend period.*

The structure of this thesis is as follows. Chapter 2 discusses the value of a firm, its capital structure and the role of dividends in pricing a stock. The prevailing tax regimes during the study period 2003–2014 are presented and discussed. A case of dividends in practice is presented starting from the declaration of the dividend. The information flow relevant for individual investor's decision making process of both ordinary and extra dividend in Finland is presented in the case. The procedures and uncertainties in the approving the board's dividend proposal are also discussed.

Chapter 3 reviews the relevant literature on dividends regarding the ex-dividend day stock price behavior, the ex-dividend period anomaly and special causes for dividend demand. Chapter 4 presents the data and the event-study methodology employed in this thesis. Chapter 5 presents the relevant test statistics and empirical results from testing the research hypotheses with chapter 6 concluding the thesis.

# 2. DIVIDEND THEORY

This chapter discusses dividends, corporate capital structure and shareholder's wealth. After a general introduction to dividends, the first section presents the Modigliani–Miller theorem regarding the value of a firm, it's capital structure and the financing options available to it, especially those relevant to dividends. The second section examines the classic dividend-based approach to stock valuation and the impact of dividend and investment policies to stock prices. The tax environment relevant to this thesis is reviewed in section 2.3. and different tax regimes are defined. The final section is a case of a firm communicating it's dividend intentions and schedule to the market place via stock exchange releases.

Dividend policies have developed through centuries. During the sixteenth century businesses developed from cooperative ventures into early versions of corporations. As a cooperative a group of investors might raise capital to fund a single venture such as a shipping voyage. At the end of the venture all assets were sold. A clear dividend policy was implemented: fully liquidated assets distributed proportionally to shareholders. Eventually corporations evolved and supply and demand for capital grew. Larger and longer lived entities started to appear and different policies concerning dividend distributions also began to develop. (Benrud 2009: 22–23.)

Deciding on the portion of earnings distributed as dividends to shareholders is one of the major financial decisions corporations make. A proper understanding of dividend policy, of how and why dividends are paid is fundamental for theories concerning financial economics. Allen & Michaely (1995: 793) listed five empirical observations emerging from discussions of dividend policy:

1. Corporations typically pay out a significant percentage of their earnings as dividends.
2. Historically dividends have been the predominant form of payout; share repurchases were relatively unimportant until the mid 1980's.

3. Individuals in high tax brackets receive large amounts in dividends and pay substantial amounts of taxes on these dividends.
4. Corporations smooth dividends.
5. The market reacts positively to announcements of dividend increases and negatively to announcements of dividend decreases.

The first two observations regarding the amount and type of dividends concern whether dividends should be paid or retained and in what proportion also which is the most effective way of distributing earnings to shareholders. Third observation notes the importance of taxes in dividend discussion. Taxes affect shareholders differently as effective tax rates vary across individual investors, corporations and institutions (Allen & Michaely 1995: 793–796). Allen, Bernardo & Welch (2000) further discuss the tax induced dividend clientele effects in their paper using an approach in which the stockholders are divided to two simplified clienteles; the untaxed institutions and taxed individuals. High dividends are found to attract institutions and consequently adding value through a more scrutinizing owners demanding higher management standard.

There are also differences across countries and through time how capital income is taxed and not all findings are applicable across tax regimes. Elton & Gruber (1970) among many others study dividends under a tax regime where capital gains are taxed at a lower rate than dividends which has not been the case with Finnish tax system during 2003–2014. In 2012 progression was introduced to capital income tax in Finland. 2014 and 2015 saw tightening of the progression making the discussion of individual tax brackets more and more relevant regarding the Finnish private investor and the decisions between cash dividends and share repurchases.

The fourth and fifth observations are relevant to dividends affect on shareholder's wealth. In order to minimize negative stock price movements firm's managers engage in dividend smoothing. Lintner (1956) found that the market puts a premium on stability of dividends and that existing dividend rate was the benchmark in the decision making process of managers regarding dividend policy. Retaining earnings beyond the investment policy needs however introduces other problems and costs such as agency problem and opportunity cost to the shareholder as equity capital is scarce economic resource. (Allen & Michaely 1995: 796–798.)

Formulation of a dividend policy framework based on firms maximizing profits and investors maximizing utility and being consistent with the five observations above and consistent with empirical findings has been a challenge to financial economists. Prior to Miller & Modigliani (1961) paper regarding the irrelevance of dividends it was widely accepted that the measure of firm's value was the discounted dividend stream it paid. (Allen & Michaely 1995: 799.)

## 2.1. Dividends and shareholder's wealth

The famous Miller & Modigliani (1958) paper presents The Modigliani–Miller Proposition I which states that under certain restrictions the market value of the firm, debt plus equity, is independent of its capital structure. Two firms otherwise identical but with firm A fully financed by equity and firm B financed part equity part debt must have the same market value. Using no arbitrage arguments Modigliani and Miller showed that the value of firm A's stock must equal value of the sum of firm B's stock and debt. If both firm's produce the same cash flows then holding firm A's stock must yield the same cash flow as holding firm B's stock and debt. When investors can replicate or undo the firm's capital structure any premium set on firm's capital structure should disappear through arbitrage. Similar arbitrage proofs have since become widely used in financial literature including for example the Black & Scholes (1973) seminal paper on options pricing.

The capital structure decision faced by the firm is whether to raise cash from lenders as debt financing or from shareholders as equity financing. In practice there is a multitude of different instruments for debt or equity financing. To simplify, there are two ways to raise equity financing, internal financing and external financing. As an example of external financing the firm can issue new shares of stock in a secondary offering. This causes stock dilution as the number of outstanding shares increases the voting control decreases, as does earnings per share and the value of old shares. This way effectively transfers wealth from existing shareholders to new shareholders. (Allen, Brealey & Myers 2013: 408–412.)

The second way to raise equity financing is internal financing i.e. through retained earnings. The cash flow from existing assets is held in reserve for future investments or reinvested in new assets on behalf of the shareholders. Instead of distributing the earnings to shareholders the firm retains earnings as a form of equity financing. (Allen et al. 2013: 408–412.)

Dividend policy refers to the way the firm's earnings are distributed to the shareholder. It can be argued that a firm with free cash flows larger than its relative profitable investment opportunities should distribute more of its earnings to the shareholders. Retaining earnings in such a firm leads to increase in risk of low quality investment decisions, overinvestment resulting in negative net present value projects detrimental to shareholder value. Excess of funds can lead to an agency problem where the interests of the managers differ from the interests of the shareholders. Shareholders demanding higher proportion of earnings also encourage a careful, value-oriented investment policy. (Allen et al. 2013: 408–418.)

The Modigliani–Miller dividend invariance proposition states that the value of the firm is independent of its dividend policy given the firm's investment decision. The managerial decision affects the cash component of investor's return but should be offset by the appreciation of the stock price therefore unaffecting the total return (Miller 1988: 100–104). Shareholder value is driven by the firm's investment policy specifically by the cash flows accrued by investments. Miller et al. (1961) propose that the shareholder value is unaffected by the firm's dividend policy as long as the dividend policy doesn't affect the investment policy. The dividend payout is seen as simply the residual between earnings and investment and to increase dividends new shares must be issued. The dividend irrelevance theorem assumes ideal economy characterized by perfect capital markets, rational behavior, and perfect certainty. Kalay et al. (2008: 9) summarized perfect capital markets with following conditions:

1. Information is costless and equally available to everyone.
2. There are no taxes.
3. There are no transactions costs associated with purchasing or selling securities.
4. There are no contracting or agency costs.
5. No investor or firm individually can influence the price of securities.

Assuming the residual nature of dividends it can be shown that dividend policy does not affect firm value. The firm's market value is only dependent on the residual of future net profits and investments. A residual dividend policy is a zero-dividend policy as long as there are positive net present value investment opportunities available. After such investment opportunities are all exhausted the surplus may be distributed as dividends. Conversely taking on negative or forgoing positive net present value projects decreases shareholder's wealth. Any increase in dividends would require external financing. The firm would have to issue the same amount of new equity as the dividend increase and therefore would not have an effect on shareholder's wealth. (Smith 2009: 115.)

Considering the flotation costs of new shares and taxes on dividends Easterbrook (1984: 650) describes paying dividends and simultaneously raising new capital as "downright inexplicable". However this is not rare behavior on the markets. Fama & French (2005: 560–562) note that although zero-dividend firms are in fact more likely to issue equity, on average from 1973 to 2002 about 58% of each year's dividend payers still made net issues of equity.

One explanation to this seemingly irrational behavior is the practice to maintain dividends at a certain level. Changes in the dividends can be interpreted as indications of the firm's changed earnings outlook. Brav, Graham, Harvey & Michaely (2005: 490–491) find that in their sample of firms 65% would rather raise external equity than cut dividends and 88% expect negative consequences when cutting dividends. The immediate benefits i.e. averted negative effects outweigh the gradual underperformance due to deviations from the investment policy. Asquith & Mullins (1983: 93–94) find dividend announcements and initiations providing valuable information to the markets.

## 2.2. Dividends and the stock price

The Gordon growth model for valuing stocks by discounting the dividend streams payable to the shareholder was introduced in the papers by Gordon & Shapiro (1956) and Gordon (1959). The discounted dividends method calculates an intrinsic value of a stock using the dividends the stock is expected to pay and a growth factor by which the dividends are expected to grow perpetually.

Miller et al. (1961: 415, 420) discuss four approaches to valuation of shares present in the literature: the discounted cash flow approach, the current earnings plus future investment opportunities approach, the stream of dividends approach and the stream of earnings approach. They then proceed to demonstrate that all four approaches are equivalent and regardless of the approach the value of the firm is the same. Their discussion also noted the implications of using external financing by issuing new shares in order to increase the dividends stream. An increase in dividends, with given investment policy, results in a change in the distribution of total return between dividends and capital gains i.e. a reduction in the terminal value of existing shares.

The intrinsic value of a stream of cash dividends $V_0$ equals the present value of all its expected dividends $D_t$ into perpetuity discounted using the market capitalization rate $k$. In case dividends are expected to stay unchanged, a stock selling at it's intrinsic value would then have market price $P_0$ of

(1) $$P_0 = V_0 = \frac{D_1}{k},$$

where $D_1$ is the expected value of the next dividend received at period $t = 1$. A dividend discount model states that the stock's intrinsic value should equal the present value of all future dividends

(2) $$V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k)^t}.$$

The dividends $D_t$ for a firm using only internal financing are defined as $D_t = Y_t - I_t$ where $Y_t$ is period $t$ earnings and $I_t$ is period $t$ investments. With both investments and dividends financed exclusively by retained earnings, investment policy becomes indistinguishable from dividend policy. In this special case optimal investment policy exists, one which in general depends on the average rate of return $r$ on firm's assets $A$ (Miller et al. 1961: 419, 424.)

The expected dividend $D_t$ is defined in Gordon et al. (1956: 105) is the difference between expected earnings $Y_t$ and the expected retained earnings $bY_t$. The ratio $b$ is the fraction of earnings retained and reinvested in the firm to generate growth in the earnings $Y_{t+1}$ at the rate $r$, the expected return on the book value of the firm's common equity. The firm's earnings are the return on total assets $Y = rA$. The dividends are related to earnings so that dividend $D_t$ is paid from the non-retained fraction of earnings $D_t = (1 - b)Y_t$ and the growth in earnings is related to the retained earnings and the rate of return on assets by $Y_t = Y_{t-1} + rbY_{t-1}$.

When the firm is expected to earn a rate of return $r$ on investment and a fraction $b$ of the earnings is retained and reinvested, the firm's dividend is expected to grow at a perpetual rate $g = br$. The stock's market price given by the Gordon growth model can be written as:

$$P_0 = \frac{(1-b)}{k-br} Y_1 . \tag{3}$$

With $D_1$ substituted for $(1 - b)Y_1$ and $g$ substituted for $br$ equation 3 can be written as

$$P_0 = \frac{D_1}{k-g} . \tag{4}$$

As long as $k > g$ the share price $P_0$ will be finite (Gordon et al. 1959: 105). From the point of capital appreciation the discounted dividends model assumes the stock price remains unchanged through time when dividends remain unchanged. For any horizon date $t$ = H, the share price $P_H$ equals the time H present value of all dividends expected to be paid after $t$ = H. The price $P_H$ can be considered as the expected sales price of the stock at given time H. The price $P_H$ equals the expected discounted cash flows generated to the stockholders at time H and $P_0 = P_H$ as the stock price equals the present value of dividends to be received from time $t$ onwards. However when the dividends are expected to grow, $P_H$ grows correspondingly. To obtain $P_H$ from equation 4, $D_{H+1}$ is substituted for $D_1$. (Bodie, Kane & Marcus 2013: 595–599.)

(5) $$P_0 = \frac{P_H}{(1+k)^H} + \sum_{t=1}^{H} \frac{D_t}{(1+k)^t},$$

where $D_t = D_0(1+g)^t$ and $P_H = \dfrac{D_{H+1}}{k-g}$.

In equation 5 $P_0$ is ex-dividend of $D_0$, the first term in the sum is the present value of $P_H$ and the second term in the sum is the present value of dividends $D_1$ to $D_H$. The components of equation 5 in figure 1 illustrate the growth in $D_t$ and the subsequent increase of $P_t$ and the stock price and dividend components of equation 5.

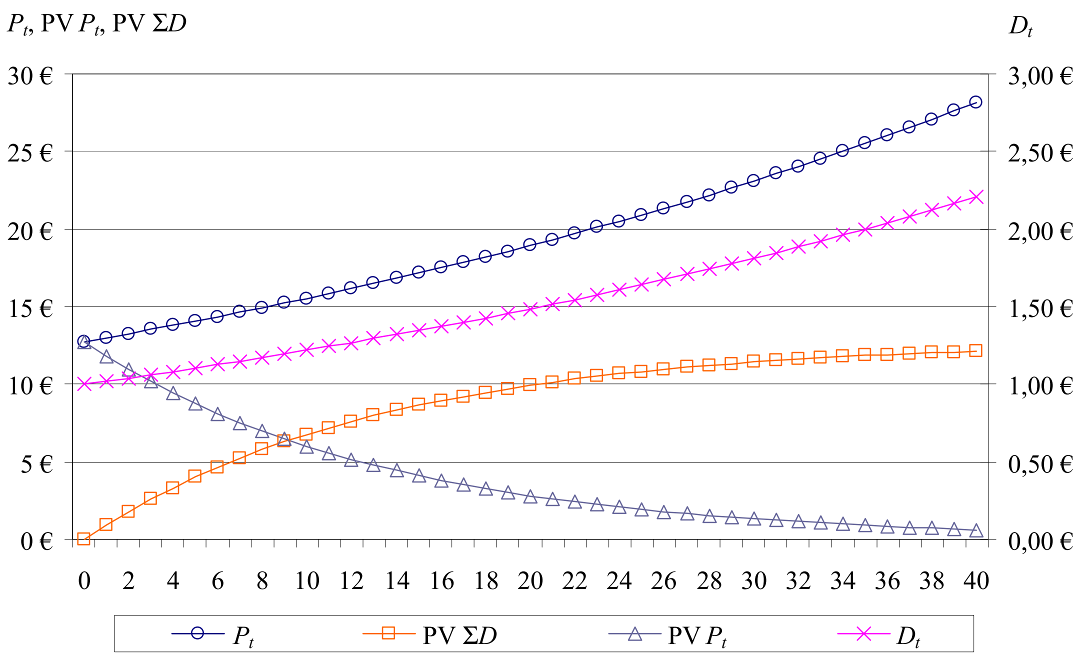


**Figure 1.** Dividend growth and present values of stock price components.

Figure 1 presents the equation 5 components of stock price $P_0$, ex-dividend of $D_0$ = 1 € with dividend growth rate of 2% and discount rate of 10%. The present value of dividends component, PV Σ$D$, exceeds the present value of stock price, PV $P_t$, within 9 years. As the present value of stock price decreases, the present value of dividends approaches the current stock price $P_0$.

Miller et al. (1961: 421) arrive at equivalent expression starting not from the dividend definition but from the notion that the growth in earnings comes from investments in real assets providing average perpetual yield $r$. The value of the firm $P_0$, ex-dividend of $D_0$, is then expressed as a function of its current earnings, the rate of growth of earnings, the internal rate of return and the market rate of return. Further more they discuss the situation where a firm temporarily has earnings growing faster than the capitalization rate. Assuming the special investment opportunities are temporary the stock price is finite and in order avoid the so-called growth paradox in equation 4 when $k < g$ Miller et al. (1961: 422) derive a closed-form approximation to take into account these temporary growth opportunities.

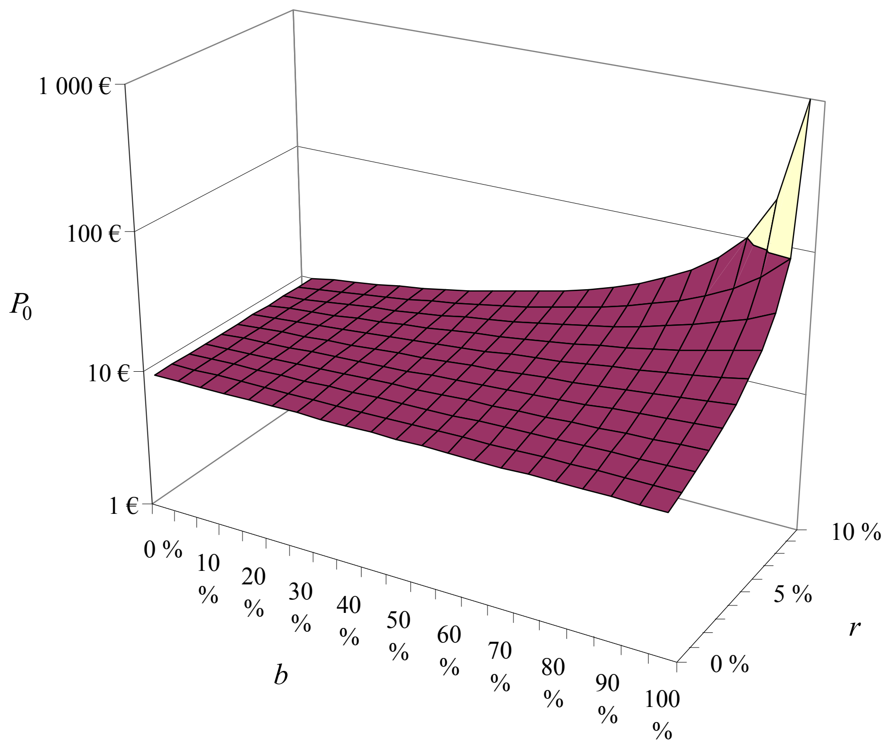


**Figure 2.** The effect of return on retained earnings on stock price.

Figure 2 shows the equation 4 with $P_0$ as a function of $b$ and $r$ where $br = g$, and constants $D_1 = 1$ and $k = 10\%$. As the dividend $D_1$ is held constant, the earnings $Y_1$ must vary with the retained earnings ratio $b$ so that $Y_1 = \frac{D_1}{(1-b)}$. When $D_1$ remains constant $Y_1$ must grow as $b$ increases. The stock price remains unchanged with respect to both $b$ and therefore also earnings $Y_1$ as long as the return on investment $r = 0$. This would imply overinvestment and waste of capital whenever $b > 0$. Despite having higher earnings the present value of dividends remains constant. The firm's return on assets $r$ is as given and the decision is to choose the ratio $b$ which maximize the value of the firm. With $r > k$ the retained earnings $bY_1$ have positive effect on shareholder's wealth as the present value of dividends increase as dividends grow. Figure 2 implies an optimal dividend policy of retaining 100% of earnings if $r > 0$.

Figure 2 shows the sensitivity of share price to investment policy. A firm with investment opportunities near capitalization rate, $r \approx k$, choosing to pay all earnings as dividends, $b = 0$, will have the same market price as a firm with no extra investment opportunities. A firm with massive earnings with no investment opportunities, $r = 0$, but still maintaining high retention ratio, $b \to 1^-$, thereby paying low dividend $D_L$ will be valued at par with a firm paying out all earnings as dividends and only having earnings equal to $D_L$. In figure 2 this is illustrated where stocks with equal dividends have the same market price regardless of the actual earnings indicated by $b$ and how destructive a sub-optimal investment policy is to shareholder's wealth. When $k = r$, equation 3 is reduced to capitalization of the firm's earnings

$$(6) \qquad P_0 = \frac{Y_1}{k},$$

where the dividend $(1 - b)Y_1$ is no longer a factor in the stock price model as the multiplier $(1 - b)$ cancels out, and $P_0$ equals simply the capitalized current earnings and equation 6 is essentially equation 1. As $k = r$ and $Y = rA$ equation 6 implies the stock is worth the assets of the firm, $P_0 = A$. With the assumption that all funding to investments is available only from retained earnings, so that $D_t = (1 - b)Y_t$ and $Y_t = I_t + D_t$ and the growth in earnings is determined by the return on the retained earnings of the previous period $Y_t = Y_{t-1} + rbY_{t-1}$ the dividend policy is indistinguishable from investment policy. Equation 6 specifies the only point where there is no single optimum dividend policy. It is not however what is meant with the Modigliani–Miller dividend irrelevance but simply a special case with exclusively internal financing (Miller et al. 1961: 424).

Figure 3 below illustrates equation 3 with $P_0$ as a function of $b$ and $r$. Earnings and capitalization rate are constant with $Y_1 = 1$ and $k = 10\%$. While figure 2 had dividend as a constant figure 3 implies a dividend range of 1€–0,01€. As $r$ approaches $k$ equation 3 reduces to equation 6 and the stock price $P_0$ is no longer dependent on the dividend $D_1$ (Gordon 1959: 103). Also at this point in frictionless economy it is equivalent for the shareholder whether the firm pays a dividend or retains the earnings. With the dividend the shareholder can choose to buy more shares and have additional dividends thereby or the firm can retain earnings and the shareholder will receive higher dividends as increased assets generate higher earnings. In both cases the resulting cash flows to the shareholder will have the same present value.

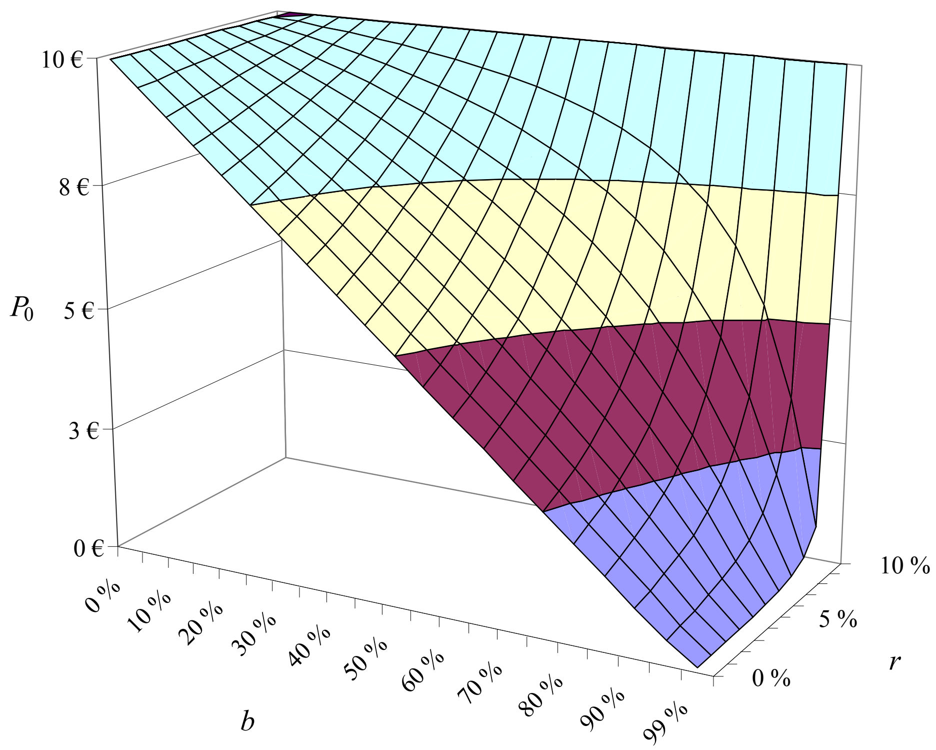


**Figure 3.** Effect of retained earnings ratio and return on assets on stock price.

In figure 3 the stock price $P_0$, a price at which the stock is expected to yield return equal to the capitalization rate $k$, from equation 3 is expressed as a function of $b$ and $r$, with constants $Y_0 = 1$ and $k = 10\%$. Retained earnings $bY_0$ invested in projects with return $r$ lower than the capitalization rate $k$ do not maximize shareholder's wealth. In the example of figure 3 retained earnings ratio $b = 0\%$ maximizes shareholder's wealth except when $r = k = 10\%$ where every ratio $b$ maximizes the wealth. Figure 3 also illustrates the effect of negative net present value projects on the firm's value as return on investment is below the capitalization rate $k$.

Bodie et al. (2013: 579–581) describe the four stages of the industry life cycle; start-up stage, consolidation stage, maturity stage and relative decline stage. A firm in the relative decline stage of the industry life cycle may find its investment environment with very few positive net present value projects as the industry has slow or even negative growth compared to the rest of the economy. As figure 3 implies for such a firm with no investment opportunities above the required rate of return the reasonable course of action is to distribute all the profits to shareholders. By doing so the shareholders are given the option to increase their holdings in the firm by buying more share or invest in other securities.

Motives for management to pursue inefficient investment policies are found in e.g. Lintner (1956) who's early work found that smoothing dividends across periods of higher and lower returns was common practice. More recently Brav et al. (2005) in addition to their survey interviewed 23 managers, mainly treasurers and chief financial officers regarding dividend and share repurchase decisions. Interviewed managers stated that they would rather forgo positive net present value investment projects than cut dividends.

Dividend stability is preferred also for other reasons. For example the signaling theory of dividends asserts that changes in dividends are a way of delivering information to the markets. With asymmetric information in the market about the future cash flows of the firm, a manager can communicate improved prospects of future earnings through a dividend increase or vice versa (John & Williams 1985). Temporal fluctuation in earnings is not reflected by the ordinary dividends. With a given investment policy for the firm, dividend smoothing using the part of earnings that would otherwise be distributed as dividends, but are retained, leads to inefficient capital allocation and effectively reduce shareholder's wealth over time.

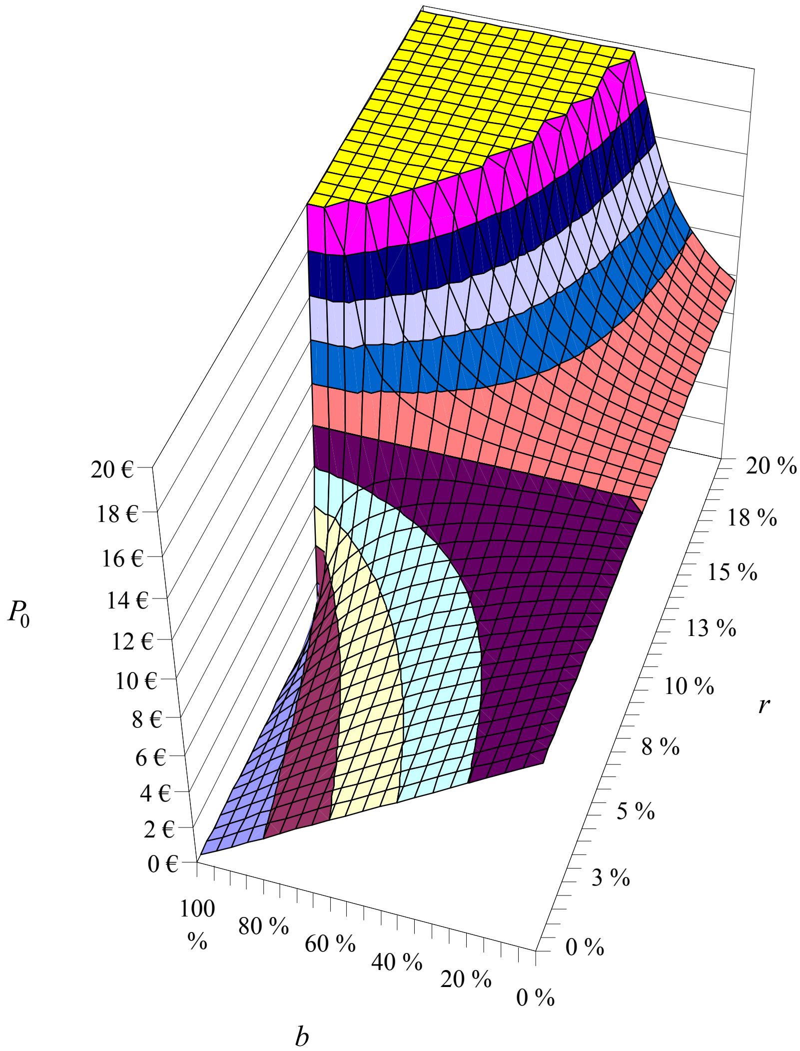


**Figure 4.** Stock price as function of retained earnings ratio and return on assets.

Figure 4 illustrates the existence of optimal dividend policy of equation 3, the Gordon growth model. Stock price $P_0$, equivalently the present value of dividends, is maximized by $b = 0$ when $r < k$. This implies a dividend policy where all earnings are distributed to stockholders as dividends. Having $r > k$, the implied dividend policy maximizing stockholder's wealth is accomplished by having $b \to 1^{-}$, considering the model's restriction of $k > br$ or $b < \frac{k}{r}$ regarding the finite stock price. With $r = k$ again every ratio $b$ maximizes the stock price when only internal equity is available.

Miller & Modigliani (1961) highlight the residual nature of the dividends and their irrelevance to shareholders wealth, considering the investment policy is unaffected. However the theorem also expects all firm's investments have at least the required rate of return and all surplus earnings are returned to the shareholders. Any proportion of the earnings retained and invested at below the required rate of return would decrease the current shareholders wealth (Miller et al. 1961: 418). Instead of sub par investments the firm has the option to return the capital to the shareholder. The shareholder may then reinvest in the firm by acquiring more shares. As the firm's return on assets remains at the higher level the increased ownership is worth more to the shareholder than returns accrued at a lower rate from the firm's investment.

The Gordon growth model implies the same conclusion: every euro invested in projects with expected return below the capitalization rate decreases share value. As long as the firm has investments available to it with return above the required rate, every euro should be invested in those projects and not paid out as dividends. The Modigliani–Miller dividend invariance theorem states that a firm paying no dividends can be as valuable as a firm paying regular dividends. The missed dividends are recaptured as capital appreciation. The Gordon growth model on the other hand requires dividends with constant properties to valuate a stock. In practice there are some stocks that do not pay dividends yet are far from worthless.

Since 1967 shortly after Buffett Partnership Ltd. headed by Warren Buffett took over Berkshire Hathaway the firm has not declared a cash dividend, and is not expected to pay dividends in the next 10–20 years. The firm nevertheless had a market capitalization of over 350 billion dollars in the end of 2014 while following a dividend policy such that Berkshire would not pay dividends so long as more than one dollar of market value for shareholders was being created by each dollar of retained earnings. Instead of cash dividends Berkshire Hathaway has decided to use share repurchases to distribute profits to shareholders and even then Berkshire's directors will only authorize repurchases at a price they believe to be well below intrinsic value of the stock. (Berkshire Hathaway Inc. 2014 Annual Report 2015.)

Firms exercising certain dividend policy will attract clienteles responding to such dividend policy. Subsequently a change in said policies according to Elton & Gruber (1970) may trigger a costly reshuffle of ownership. The selected dividend policy should obviously cater to the needs of the current shareholders instead of dividend capturers or tax arbitrageurs (Allen et al. 2013: 1–10).

With taxes however institutions, investors and corporations are no longer indifferent towards the level of dividends. Fischer Black (1976) coined the term 'dividend puzzle' in his paper questioning why corporations pay dividends and why investors pay attention to dividends. The firm has the option to issue debt to investors who prefer cash flows but are taxed unfavorably vis-à-vis dividends. A dividend or the prospect of dividends may represent the only return on investment or a chance to sell the shares in the future. For many investors a dividend stream may be a requirement for holding a stock. Then again the lack of dividend may indicate the firm's confidence in being able to earn higher return on it's capital and thus higher dividend in the future as well as a higher price for the stock.

## 2.3. Dividend taxation

Dividends from listed companies to individual investors in Finland are currently partially tax exempt with remaining part taxed as capital income. This causes a partial double taxation on of dividends. A full imputation system preceded the current tax system. Since 2005 70% of the dividend has been considered as taxable capital income and since the beginning of 2014 the ratio was raised to 85%. The following passage discusses the evolution of the prevailing capital income tax regimes in Finland spanning the 2003–2014 period of this thesis. All firms in the sample of this thesis have legal domicile in Finland and the dividends are subject to the same taxation.

The dividend tax practice discussed here can be considered as an instant tax as it is withheld by the dividend payer. The capital gains tax on the other hand is due the following year of the sale incurring the tax liability. Taxes on capital gains are therefore deferred until they are realized when e.g. the shares are sold. Consequently with the option to choose the timing of realizing capital gains and losses the rational investors can affect the timing and amount of their tax payments. For example instead of realizing capital gains the investors can instead choose to liquidate a losing part of the portfolio and defer the taxable capital gains indefinitely. (Kalay et al. 2008: 10–11.)

The first and the most profound change in Finnish tax legislation during 2003–2014 took effect in January 1st 2005. Prior to 2005 a full imputation system was in place in order to avoid double taxation on dividend distributions. Considering the firm paying the dividend had already paid the corporate tax on it's earnings, the receiving shareholders received the dividends with zero effective tax rate. The receiving shareholder was taxed at a personal capital income rate for the dividend then imputed the amount corresponding to the already paid corporate tax. As a standard case the corporate income tax rate was equal to the personal capital income tax rate and no additional tax payments occurred. During 2000–2004 both tax rates were at 29%. (Kari, Karikallio & Pirttilä 2008: 170–172.)

In 2005 the tax system was reformed. The full imputation system was replaced by the partial double taxation of dividends, corporate tax rate was lowered to 26% and personal capital income tax was lowered to 28%. Under the new tax system the dividend taxation increased. 70% of the dividend was taxed at 28% personal capital income tax and 30% was tax exempt bringing the personal dividend tax up to 19,6%. Year 2005 was the adjustment period during which 57% of the dividend was considered taxable capital income with dividend tax rate of 16%. The combined tax rate of dividend and corporate tax came up to 40,5% from 29%. (Hietala & Kari 2005: 6–8.)

2012 saw modest changes to tax legislation. Corporate tax rate was reduced 1,5 percentage points to 24,5%. Progression was introduced to personal capital income tax. The capital income tax rate rose for 28% to 30% and for income above 50 000€ the tax rate rose to 32%. The effect on dividend tax was a rise from 19,6% to minimum of 21% and maximum of 22,4%. The lower bound of the combined tax rate decreased ever so slightly to 40,4% and the upper bound rose to 41,4%.

The fourth tax period started with 2014. The tax free portion of the dividend was halved and progression was tightened. 85% of the dividend was considered taxable capital income and the higher tax applied to income over 40 000€. Corporate tax was lowered to 20% from 24,5%. The combined tax rose from 40,4%–41,4% range to 40,4%–41,8% range. Dividend tax on the other hand was heavily affected rising more than 4,5 percentage points to 25,5% and up to 27,2%.

Table 1 below shows the changes in dividend tax and capital income tax during the study period 2004–2014. Dividend tax went up from 0% to 25,5% in the low tax bracket to 27,2% in the high tax bracket. While the corporate income tax fell from 29% to 20% the combined tax on a firm's distributed profits rose around 40% from 29% to 40,4%–41,8%, depending on the tax bracket. In case the investor has no deductible costs this is a significant change. As the year 2015 brought along even tighter progression than 2014, starting from 30 000€ and a higher upper bound of 33% on personal capital income, it remains to be seen if cash dividends can retain their popularity among private full tax paying investors.

**Table 1.** Taxes in Finland 2003–2014 (Verohallinto 2015, Veronmaksajat 2015a,b).

| Period | Dividend tax | Capital income tax | Dividend taxable portion | Corporate tax | Combined tax |
|---|---|---|---|---|---|
| 2003–2004 | 0,0% | 29% | 0% | 29% | 29,0% |
| 2005 | 16,0% | 28% | 57% | 26% | 37,8% |
| 2006–2011 | 19,6% | 28% | 70% | 26% | 40,5% |
| 2012–2013 | 21,0%–22,4%* | 30%–32%* | 70% | 24,5% | 40,4%–41,4%* |
| 2014 | 25,5%–27,2%** | 30%–32%** | 85% | 20% | 40,4%–41,8%** |

*for capital income exceeding 50 000€

**for capital income exceeding 40 000€

The tax rate is one component determining the amount of taxes payable while the another is the possible deductions. There are numerous deductions made from capital income tax related to acquiring said income such as interest payments on certain types of loans. Home mortgage interest deduction is one major source of household capital income tax deductions. In 2011 100% home mortgage interest payments were deductible from capital income at the 28% capital income tax rate having the net effect of 28% of interest payments being deductible from capital income.

After steady increases in 2012–2014 the percent deductible in 2015 is 65% which at 30% capital income tax rate has a net effect of 19,5% of interest payments being deductible from capital income (Veronmaksajat 2015c). The reductions of these deductions in part tighten the capital income taxation affecting dividends compared to capital gains from sales. Table 1 shows this decade has had quite significant changes especially for dividends. The deductible home mortgage interest payments are only one fragment of the total tax system but having that fragment reduced by 30% while dividend taxation has increased 30% for the low tax bracket and 39% for the high tax bracket one would expect noticeable consequences.

Listed below in table 2 the average household capital income for dividends and capital gains in Finland from 2003 to 2013 reflect the market events and legislation changes. The tax reform of 2005 can be seen as a spike in dividend payments in 2004 and after the adjustment period of 2005, the year 2006 shows the lowest amount of dividends paid of the study.

The financial crisis of 2007–2009 is also observable in table 2 below. The column listing capital income from sales for the years 2008–2009 showing average capital income from sales falling by 43% and 39% respectively. Despite the steep fall in capital gains the received dividends remained relatively unaffected experiencing only a modest dip in 2009. This however is more likely to reflect the managers' will to smooth dividends over periods of high and low income than anything else. The capital income from sales may as well be affected by the lower number of trades as much as the lower securities prices.

**Table 2.** Average household capital income 2003–2013 (Tilastokeskus 2015).

| Year | Dividends | Capital income from sales |
|---|---|---|
| 2003 | 1 525 € | 719 € |
| 2004 | 1 890 € | 935 € |
| 2005 | 1 518 € | 1 224 € |
| 2006 | 1 374 € | 1 626 € |
| 2007 | 1 529 € | 2 044 € |
| 2008 | 1 559 € | 1 155 € |
| 2009 | 1 414 € | 699 € |
| 2010 | 1 564 € | 1 098 € |
| 2011 | 1 713 € | 1 141 € |
| 2012 | 1 517 € | 698 € |
| 2013 | 1 535 € | 1 069 € |

## 2.4. Dividends in Finland

Investors are able to form their expectations about the firm's upcoming dividend based on the firm's reporting required by the market place i.e. Helsinki Stock Exchange. It is expected that companies announce their next year's financial reporting schedule well before the end of the year and this schedule contains the date when the Annual General Meeting is planned to be held on. The information is part of the Finnish Corporate Governance Code by the Securities Market Association (2010). The code is intended to harmonize the information and communications of Finnish listed corporations. A company may depart from an individual recommendation, however, but in this case, it must disclose such a departure and provide an explanation for doing so following the comply or explain principle.

The ex-dividend date is the next trading day after the Annual General Meeting where among other things the amount of dividend is decided. There are sometimes good news announced at the Annual General Meeting and sometimes bad news. For the purpose of this thesis the information content of the Annual General Meeting is considered to be zero. The empirical part of this thesis examines the abnormal returns accruing during periods within 20 trading days before and after the ex-dividend date.

As an example of a firm's communication regarding dividend the following are excerpts from KONE Corporation's stock exchange releases concerning the extra dividend of 2013 and the 2014 ordinary dividend. This example establishes the timeline of a dividend case for both ordinary and extra dividends. KONE has been consistent in the past regarding the timing of the Annual General Meeting. Since 2006 the past ten meetings have taken place on dates between February 23rd and March 5th. The extra dividends of 2012 and 2013 are seemingly arbitrary.

> **"KONE Corporation, stock exchange release, October 22, 2013 at 12.35 p.m. EET**
> The Board of Directors of KONE Corporation has decided to propose to an extraordinary general meeting of the shareholders to be held in December, 2013 that an extra dividend of EUR 1.30 per class B share and EUR 1.295 per class A share be distributed to KONE shareholders. The proposed extra dividend would amount to EUR 332.8 million in total, based on the current ownership of treasury shares.
>
> The invitation to the extraordinary general meeting will be published by means of a separate stock exchange release and on KONE's website at a later stage."

This was the first announcement of the extra dividend 30 trading days before ex-dividend date. The amount of the dividend is stated but the exact date is not. The second release defined the date of the Extraordinary General Meeting:

> **"KONE Corporation: Notice to the General Meeting**
> **KONE Corporation, stock exchange release, October 28, 2013 at 2.00 p.m. EET**
> Notice is given to the shareholders of KONE Corporation to the Extraordinary General Meeting to be held on Monday 2 December 2013 at 2.00 p.m. at Hilton Helsinki Kalastajatorppa, Kalastajatorpantie 1, Helsinki. Registration to the meeting will commence at 1.00 p.m.
>
> A. Matters on the agenda of the Extraordinary General Meeting
>
> 6. Resolution on the payment of extra dividend
>
> The Board of Directors proposes that for the financial year 2012 an extra dividend of EUR 1.295 be paid for each class A share and an extra dividend of EUR 1.30 be paid for each class B share. The record date for dividend distribution is December 5, 2013 and the dividend will paid December 13, 2013."

At 26 trading days before the ex-dividend date the market is informed of the date and amount of the extra dividend. There is always the possibility that the General Meeting votes against the Board of Directors proposal but such displays of distrust are very rare. And as was the case, the Board's proposal was approved:

> **"Decisions taken by the Extraordinary General Meeting of KONE Corporation**
>
> KONE Corporation, stock exchange release, December 2, 2013 at 4.15 p.m. EET
>
> KONE Corporation's Extraordinary General Meeting was held in Helsinki on December 2, 2013. As proposed by the Board of Directors, the meeting approved extra dividends for the financial year 2012 of EUR 1.295 for each of the 38,104,356 class A shares and EUR 1.30 for the 223,128,073 outstanding class B shares. The date of record for the dividend distribution is December 5, 2013, and the dividends will be payable on December 13, 2013."

On December 2nd the General Meeting approved the proposal for extra dividends. The date of record was the 5th of December meaning the ex-dividend date was December 3rd. In the last quarter of 2013 Regarding the Annual General Meeting among other issues KONE Corporation gave the following release:

> **"Financial reporting schedule of KONE Corporation in 2014**
>
> **KONE Corporation, stock exchange release, October 22, 2013 at 2.15 p.m. EET**
>
> KONE Corporation will publish its Financial Statements for the accounting period January 1, 2013-December 31, 2013 on Tuesday, January 28, 2014. The Annual General Meeting of KONE Corporation is planned to be held on Monday, February 24, 2014."

This release is required by the Finnish Corporate Governance Code by the Securities Market Association (2010) in order to harmonize the practices of listed companies and the information given to shareholders and other investors. It contains information which allows investors to expect a proposal of dividend from the Board of Directors coinciding the publication of financial statements for 2013. The notice of the General Meeting was given January 28th:

> **"KONE Corporation: Notice of the General Meeting**
>
> **KONE Corporation, stock exchange release, January 28, 2014 at 2.00 p.m. EET**
>
> Notice is given to the shareholders of KONE Corporation of the Annual General

Meeting to be held on Monday 24 February 2014 at 11.00 a.m. in Hall A and B of the Congress Wing at the Finlandia Hall (entrances M1 and K1), Mannerheimintie 13, Helsinki. The reception of participants will commence at 10.00 a.m.

A. Matters on the agenda of the General Meeting

8. Resolution on the use of the profit shown on the balance sheet and the payment of dividends

The Board of Directors proposes that for the financial year 2013 a dividend of EUR 0.9975 is paid for each class A share and a dividend of EUR 1.00 is paid for each class B share. The date of record for dividend distribution is proposed to be February 27, 2014 and the dividend is proposed to be paid on March 6, 2014.

16. Authorizing the Board of Directors to decide on the repurchase of the Company's own shares

The Board of Directors proposes that the General Meeting authorizes the Board of Directors to decide on the repurchase of no more than 51,140,000 treasury shares with assets from the company's unrestricted equity

**C. Instructions for the participants in the General Meeting**

1. Right to participate and registration

Each shareholder, who is registered in the shareholders' register of the Company held by Euroclear Finland Ltd on the record date of the General Meeting, which is February 12, 2014, has the right to participate in the General Meeting."

At this point investors know the ex-dividend date, have the financial statements for the past year and are able to make accurate assessments whether or not the Board of Directors' proposal for dividends is approved. If the proposed dividend does not match the shareholder's preferences there is sufficient time to rearrange the share holdings. There is also a proposal to authorize a share repurchase of 51140000 shares and information of the registration date. Shareholders wishing to influence the proposals of the Board of Directors have the right to vote at the General Meeting provided that they are registered in the shareholders register on the record date. The register is held by Euroclear Finland Ltd.

This is where the period of interest for the purposes of this thesis begins. At $t = -20$ before the ex-dividend date the shareholders and other investors are considering how much, if at all receiving the proposed KONE Corporation's cash dividend increases their wealth. At $t = -1$ comes the General Meeting day confirming the amount of the dividend:

**"Decisions taken by KONE Corporation's Annual General Meeting and Board of Directors**

Stock exchange release, February 24, 2014, at 1.45 p.m. EET

Matters relating to the Annual General Meeting

KONE Corporation's Annual General Meeting was held in Helsinki on February 24, 2014. The meeting approved the financial statements and discharged the responsible parties from liability for the financial period January 1-December 31, 2013.
The General Meeting approved dividends of EUR 0.9975 for each of the 76,208,712 class A shares and EUR 1.00 for each of the outstanding 436,474,010 class B shares. The date of record for dividend distribution is February 27, 2014 and dividends will be payable on March 6, 2014."

After this announcement an investor wishing to receive the dividend has until the end of the trading day to buy the shares. The next trading day is the ex-dividend day. The stock then trades without the right to the dividend also there is no longer an obligation to hold the shares in order to receive the dividend.

As the KONE Corporation's two dividend examples show, the dividend process strives to be clear and predictable. The major uncertainty arises from the stockholders voting on the board's proposal. It is rare for the general meeting to vote against the board's proposal and usually involves firms with concentrated ownership. Such case was in January 24th 2013 when the general meeting of Saga Furs rejected the board's proposal for a 2,10€ dividend in favor of a lower 1,70€ dividend as proposed by the majority stockholder during the meeting.

A stock exchange release regarding the changed dividend came out at 16:10, just over two hours before the market closed, and a stock exchange release regarding the decisions taken by the general meeting came at 17:15. The stock fell 1,58€ or 5,76% on general meeting day and exactly the amount of the dividend, 1,70€ on ex-dividend day with market index falling by –0,88% and –0,70% respectively.

# 3. LITERARY REVIEW

Since Lintner (1956) and Gordon et al. (1958) and before them the dividend related topics have ranged from the valuation of the firm to corporate governance, and from studies to gain understanding from the optimal dividend policy to studies of the investor behavioral traits. This chapter of the thesis reviews relevant themes in the dividend literature and research regarding the value of the dividend and the stock price behavior during the ex-dividend period.

## 3.1. The ex-dividend day stock price behavior

The behavior of stock prices around ex-dividend day is one indicator relating the value of dividends and capital gains, an important issue in corporate dividend policy. The ex-dividend day studies investigate the factors influencing the ex-day price drop ratio to dividend (Boyd & Jagannathan 1994: 3). Several studies since Campbell & Beranek (1955), followed by Durand & May (1960) among others, have found ex-dividend day stock prices falling by less than the amount of the dividend.

Elton & Gruber (1970) argued that the price drop is due to differential tax treatment between capital gains tax and dividend tax. At the time of their 1970 paper dividends were taxed as ordinary income at higher rate than capital gains. They also used the stock's ex-dividend day behavior to infer the marginal stockholder's tax bracket and discussed the role of stockholder's tax bracket to the firm's optimal investment policy. Starting from the premise that the stockholders maximize their after-tax wealth they derived an expression between the ex-dividend behavior of the stock price and the marginal tax rates of marginal stockholders written as

(7) $$\frac{P_B - P_A}{D} = \frac{1 - T_D}{1 - T_C}$$

where $P_A$ is the after dividend stock price, $P_B$ is the before dividend stock price, $D$ is the dividend amount and $T_D$ and $T_C$ are the rate at which the dividend is taxed and capital gains tax rate respectively. The ex-dividend day price drop ratio $\Delta P/D$ is expected to be such that the prospective marginal traders are indifferent as to whether they buy before or after the stock goes ex-dividend.

Elton & Gruber (1970) also tested and found support to the presence of tax induced dividend clientele effect suggested by Miller et al. (1961) using the dividend yield as variable. The higher the dividend yield, the lower the percentage of total return an investor expects to receive in the form of capital gains. High dividend yield stocks have a clientele preferring dividends over capital gains and vice versa. A preference for dividends over capital gains is found in the two highest dividend yield deciles of the data where the stock price falls by more than the dividend.

Since the 1970 paper by Elton & Gruber more than a hundred articles have been published in financial economics journals with four general categories of discussion regarding the ex-day price drop and testing for the tax effects on pricing. These articles can be divided into four categories. The first category has replicated the original study from 1970 on U.S. markets on different time periods and on Canadian, European and Asian markets. The second category has examined the effects of changes in tax laws and how the ex-day price drop is related to changes in tax policies. (Elton, Gruber & Blake 2003.)

Eades, Hess & Kim (1984) repeat the ex-dividend day experiment using alternative methodology and are able to confirm previous findings regarding taxable distributions to common stocks. They proceed to observe taxable distributions on preferred stock, non-taxable cash distributions on common stock and also stock dividends and splits. These results however are not completely consistent with the tax induced ex-day price behavior. Taxable preferred stock dividends have significantly negative excess returns on ex-day inconsistent with the tax hypothesis but may be explained by the tax induced dividend clienteles for example corporations having to pay a lower tax on dividends compared to capital gains. The non-taxable stock dividends and splits have positive excess returns while non-taxable cash distributions, which reduce the investors tax basis by the distributed amount, have significantly negative excess return, both cases being inconsistent with simple form of the tax hypothesis or the tax induced dividend clienteles. Positive excess returns for distributions that have no tax implications obviously cannot be tax premiums.

Michaely (1991) examines the effects of 1986 U.S. tax reform act which in 1987 first reduced then in 1988 eliminated the difference between tax treatment of realized long-term capital gains and dividend income. Contrary to the long-term trading hypothesis the price drop did not change significantly i.e. the dividend averse long-term individual traders did not significantly affect the ex-day stock price. The evidence supported the hypothesis that short-term traders and corporate traders capturing dividends primarily influenced the ex-day price behavior.

Sorjonen (1988) examined the relative valuation of dividends and capital gains during 1960–1985 measured by the ex-day price drop. The results pointed to a shift from capital gains preference in 1960–1968 to dividends preference in 1977–1985. The ex-day stock price drop ratio to dividend was found to be 78%–92% and consistent with earlier studies. Also in accordance with earlier studies short-term trading was not likely to determine the ex-day stock price behavior in Finland due to high transaction costs including a 0,7% stamp duty.

In more recent article Sorjonen (2002) observes abnormally high trading volume on the cum-days and ex-days, abnormally low volume on the two following trading days and a price drop ratio of 0,7–0,75 suggesting preference of capital gains over dividends. The article finds no evidence of statistically significant abnormal returns around the ex-day nor short-term trading affecting ex-day price behavior. Short-term trading is assumed to be hindered by transaction costs and absence of short-selling possibilities.

Korkeamaki, Liljeblom & Pasternack (2010) study the tax regime change of 2005 in Finland. They find Finnish firms altering their dividend policies based on the changed tax incentives of their largest shareholders. Consistent with tax induced dividend clienteles theory they find evidence of changes in ownership structure adjusting to the new tax regime. Firms were found to increase dividends and pay additional extraordinary dividends before the reform took effect. A decrease in dividend payouts and a significant increase in share repurchases was observed after the tax regime change.

Third category of articles examines an alternative explanations to the price drop such as arbitrage by short term traders. Kalay (1982, 1984) pointed out the arbitrage opportunities opening from a significant difference between the dividend and the drop in the stock price. Kalay (1982) argued that if the trading costs are not large enough to prevent short-term trading on all dividend yield levels and that inferring stockholders' marginal tax rates from such data was impossible. The paper prompted a reply from Elton, Gruber & Rentzler (1984) which underlined the significance of the bid-ask spread to any arbitrage trading. As in Elton & Gruber (1970), Kalay (1982) also found positive correlation of price drop and dividend yield and a price drop larger than dividend for high dividend yield stocks supporting the tax induced dividend clientele theory.

Miller & Scholes (1982) also argue against the differential tax treatment of dividends and capital gains setting the ex-day stock price. The transactions costs with respect to the amount of the dividend being more likely to explain the less-than-dividend price drop than the tax penalty on dividends over long-term capital gains. There exists short-term traders in the market, such as securities dealers and brokers, who have low transaction costs and have the same tax rate for dividends and capital gains hence they are expected to dominate the short-term equilibrium.

The fourth category suggests that market microstructure explains the less-than-dividend price drop. Frank & Jagannathan (1998) note that, under certain conditions, rational investors prefer to buy on ex-dividend day and sell on cum-dividend day. The market makers are assumed to step in to take the order imbalance due to supply and demand differences around the ex-date hence the cum-day trading is done at bid prices and on ex-day at ask prices. Also for market makers capturing and reinvesting dividends is relatively easier due to the comparative cost advantages. The resulting impact on stock price is assumed to be positive regardless of amount of the dividend explaining the less-than-dividend price drop.

Similarly Bali & Hite (1998) consider stock price discreteness due to the tick size as a possible cause for the dividend price drop ratio $\Delta P/D$ differing from 1. They assume the stock price drops by a multiple of the tick size that is less than the dividend. Campbell & Beranek (1955) examined stocks paying dividends amounting to exact tick multiples while Durand & May (1960) concentrated on the AT&T capital stock also paying an exact tick multiple sized dividend. Given the dividend sample median of 20¢ in Bali & Hite (1998), a tick size of $⅛ or 12,5¢ would result to a price drop ratio of 0,625 assuming the price drop is less than the dividend. In addition when 99,2% of dividends they observed were $1 or less, the price discreteness due to the tick size is a nontrivial fraction of the dividends.

Graham, Michaely & Roberts (2003) examine the effects of the capital gains tax reduction from 28% to 20% in 1997 and the decimalization of pricing quotations in the New York Stock Exchange in 2001 to the ex-dividend day price reactions. Their findings are inconsistent with the market microstructure theory. As the decimalization brought the tick size to 1¢ the median effective ex-day bid-ask spread fell from 12,5¢ and 6,25¢ of previous studies to 2¢. This effective reduction of transaction costs did not however drive the price drop ratio significantly closer to 1 as suggested by previous studies. Further more they did observe the market depth falling suggesting the observed bid-ask spread was not an accurate measure of the transaction costs, especially for large traders. That in turn might explain why decimalization had such limited effect on ex-day prices. The capital gains tax reduction on the other hand had the expected effect on the ex-day price behavior consistent with the tax hypothesis.

Using comprehensive investor-level data Rantapuska (2008) finds investors trading overnight when stock goes ex-dividend depending on dividend yield and transactions costs, the latter of which were ranging from 0,00244% for brokers that are members of the stock exchange to 8,25€ + 0,2% for private investors. Only a fraction of the trading activity was deemed to be short-term trades though. Domestic taxable investors and non-taxable institutions were able to trade profitably opposite positions due to differential tax rates on capital income and a policy of no deductibility restrictions on short-term capital losses. Rantapuska confirms the earlier notions that individual investors do not necessarily behave in a tax-optimal way and also as several investor groups trade around ex-day one group of marginal investors is difficult to identify.

Michaely & Vila (1995) derive a ex-dividend equilibrium price for a number of traders with differing tax rates for dividend and capital gains income. They propose the ratio $\Delta P/D$ to be a function of variables regarding tax rates and risk preferences of the traders. Michaely & Vila (1995) observe an increase in abnormal trading volume associated with a decrease in variance especially for the high dividend yield stocks. They also find support for the earlier finding by Lakonishok & Vermaelen (1986) of increased trading volume on the ex-day for high dividend yield stocks and that lower trading costs increase trading volume around the ex-day.

Boyd & Jagannathan (1994) list three stylized facts regarding the ex-dividend day stock price behavior in the literature. Firstly, the size of the dividends, the discreteness of the stock prices and the transaction costs affect pricing and are an important issue in empirical research. Second, there may be several classes of traders trading around the ex-day, with systematically different cost structures regarding e.g. taxes and transaction costs, allowing a price drop range of mutually profitable trading. The third stylized facts concerns dividend capture activities which account for a substantial proportion of ex-day trading primarily for high dividend yield stocks.

Boyd & Jagannathan (1994) further theorize that since the price data around ex-day contains a mixture of observations of the actions of arbitrageurs, dividend capturers, or both, the relation between percentage price drop and dividend yield is nonlinear. They also note the importance of the volatility of the price drop which indicates the risk dividend capturers are exposed to. High dividend yield is not the only considerable factor determining the suitability of a stock for the risk averse trader class capturing dividends.

## 3.2. The ex-dividend period anomaly

Eades et al. (1984) besides investigating the ex-dividend day price drop, make their second observation was regarding the ex-dividend period returns ±5 days around the ex-day. Average daily excess returns were found to be positive and statistically significant from $t = -5$ to $t = 0$, the ex-day, and negative from $t = +1$ to $t = +5$ for their sample of common stocks with taxable distributions. They found return on $t = -1$ being not only statistically significant and positive for all distributions in the sample but larger than ex-day return for all distributions except stock dividends and splits. Ex-day positive return was also observed for stock dividends and splits. Negative ex-day returns were observed for preferred stocks and non-taxable cash distributions. All four samples had large returns for days –2 to +2. Nonparametric test also confirms that the presence of abnormal returns is not sensitive to the statistical assumptions. Despite the sampling procedure being biased towards positive announcement effects, they find no explanation for the abnormal returns on the ex-dividend period.

Lakonishok & Vermaelen (1986) detect similar effect of abnormal stock price increases before ex-day, depending on the dividend yield. and abnormal decreases afterwards. Michaely (1991) notes that the ex-dividend period excess returns for the highest two yield deciles during the 1986 tax reform act are not limited to the ex-day itself. Most of the five days leading up to the ex-day exhibit positive excess returns with four days from 1986 and one day from 1987 being statistically significant. A significant negative returns are documented on both the ex-day and the following day. The effect of ex-dividend trading activity carried on to the nine days following ex-day exhibit negative excess returns.

Hartzmark & Solomon (2013) study the reaction of stock prices during months when companies are expected to issue dividends. They hypothesize price pressure from dividend seeking investors distorts the demand and supply of shares thereby increasing the return on dividend paying months. They find abnormal returns present during the period from dividend announcement day to ex-dividend day with ex-day returns less than half of the total abnormal returns of the dividend period and around 80% of returns occurring after the announcement. Considering that during the period from the announcement day to the ex-day there are no news releases and the size of the dividend is known, the abnormal returns are consistent with the price pressure due to the demand for dividends. Accordingly during the period after ex-day there is a price reversal and negative abnormal returns. Higher returns and subsequent reversals are also found for less liquid stocks and stocks with higher dividend yields. This effect is milder the longer the time between dividend announcement and ex-day.

Hartzmark & Solomon (2013) also document significantly higher returns on dividend months during recessions and times of high volatility. Assuming abnormal returns and reversals are due to price pressure, three predictions can be made. Firstly, lower liquidity causes higher returns and stronger reversals. Secondly, the effects of price pressure increase as the ex-day approaches. Thirdly, the reversal after ex-day should be related to cum-dividend stock price increases. Results suggest that markets are not fully incorporating the predictable component of dividend payments.

## 3.3. Demand for dividends

A behavioral finance approach is to view the utility of cash dividends vis-à-vis capital gains. Baker, Nagel, & Wurgler (2007) analyze the relative propensity to consume from dividends and capital gains amongst investors. As one explanation to the findings they suggest that dividends and capital appreciations are put on one of the three different mental accounts for wealth suggested by Shefrin & Thaler (1988), current income, current assets or future income. From these accounts the temptation to spend is assumed to be greatest for current income and least for future income. Dividends are considered as current income and therefore the propensity to consume from dividends is higher.

The difference in dividends and capital gains is clear when dividends are seen as permanent income separate from the original capital unlike capital appreciation which is still seen as part of the original capital and to be left intact. Household capital gains are also found to vary more than dividends. However large special dividends are less likely to be consumed than ordinary dividends. The effect of interest income is similar to dividends and also this income increases personal consumption expenditures of all types. Baker et al. (2007) find no evidence of capital gains having significant effect on consumption but find a statistically significant positive relation between dividends and the level of consumption.

Shefrin & Statman (1984, 1985) discuss motives why some investors are willing to pay a premium for cash dividends and whether dividends and capital gains are perfect substitutes for each other. They find preference for cash dividends and high yield stocks may be explained in some cases by mental accounting. A similar behavioral explanation is behind investor's reluctance of realizing capital losses and instead sell stocks with capital gains despite the tax advantage they are missing Another perspective is regret aversion.

Shefrin & Statman (1984) give an example of two persons, one receiving a $600 dividend and second selling stock for $600. In both cases the money is consumed and subsequently the stock price increases significantly. The consumption from the dividend is found to cause less regret even though the person receiving the dividend had the opportunity to reinvest it. Shefrin & Statman (1984) argue that if dividends and capital gains were perfect substitutes both cases would induce the same amount of regret and that for regret averse people consumption from dividend may be preferred to consumption from capital. Breuer, Rieger & Soypak (2014) report considerable cultural differences in preferences for dividends in their cross-country study. They relate the preference for firms with high dividend payout policies to investors loss aversion and patience level.

# 4. DATA AND METHODOLOGY

The empirical part of this thesis utilizes event-study methodology as presented in The Econometrics of Financial Markets by Campbell, Lo and MacKinlay (1997) and Event Studies in Economics and Finance by MacKinlay (1997). The event-study methodology has developed and matured over its 80-year history and the applicability of the methodology has led to its wide popularity as one of the standard tools in financial research. (Campbell et al. 1997: 149–150.)

Event-study technique enables empirical financial research to assess the impact of a given event on the firm's share price. To assess the impact first the normal rate of return need to be established. The difference between the normal return and the realized return is the abnormal return. This abnormal return quantifies the impact of the event on the share price. Normal return is estimated using a reference asset, in this case a stock index. (Bodie et al. 2013: 359.)

## 4.1. The data

The period of interest for this thesis is 2003–2014. The data used consist of daily closing prices of the selected stocks, and closing values of the OMX Helsinki Benchmark_GI stock index retrieved from NASDAQ OMX Nordic. The prices were adjusted for stock splits and missing data were removed. Dividend distribution dates and amounts were retrieved from Kauppalehti Osinkohistoria and stock exchange releases of individual companies regarding dividend announcements. The dividend distributions were corrected for stock splits and subsequent rounding errors. Monthly Euribor interest rate quotes for 3 month and 12 month maturities was retrieved from the Bank of Finland.

Two ex-dividend period observations were removed from the ex-dividend period anomaly analysis due to clearly non-dividend related price movements. A public tender offer for Tieto shares was announced by Cidron Services during the event window of

2008 dividend payment. The announcement caused a statistically significant 43,5% abnormal return (41,9% unadjusted return) on the announcement day.

Second case was on April Fools' Day 2014. The Weir Group Plc, a United Kingdom based engineering company, made an indicative all share merger proposal to Metso. On the announcement day the proposal announcement caused a 19,4% (17,4% unadjusted return) statistically significant abnormal return during the event window of the 2014 dividend payment. Both Tieto's and Metso's dividend payments are included in the ex-dividend day stock price behavior part of the study.

The following 24 stocks in table 3 are selected to the study.

**Table 3.** The stocks included in the study.

| Sector | Stock |
|---|---|
| Basic Materials | Kemira, Stora Enso R, UPM-Kymmene |
| Consumer Goods | Amer Sports, Fiskars, Nokian Tyres, Olvi A |
| Consumer Services | Kesko B, Sanoma, Stockmann |
| Financials | Sampo A |
| Health Care | Orion B |
| Industrials | Huhtamäki, KONE, Konecranes, Metso, Rautaruukki, Uponor, Wärtsilä, YIT |
| Technology | Nokia, Tieto |
| Telecommunications | Elisa |
| Utilities | Fortum |

269 cash dividends are observed in the data. Amounts of dividends are adjusted for stock splits. Two instances of dividends payable as shares were observed in the data. Fortum's Annual General Meeting in March 2005 approved the distribution of 85% of the shares in Neste Oil as dividend. The General Meeting also approved a cash dividend of 0,58€ which was entirely withheld for withholding tax on dividend income for both the cash dividend and the share dividend capital income tax. Both the stock and the cash

dividends were excluded from the data concerning both the ex-dividend day stock price behavior and the ex-dividend period anomaly parts of the study.

In 2010 Kemira distributed 86% of Tikkurila's shares as dividend. As with Fortum previously the share dividend is excluded from the ex-dividend period anomaly part of the study and from the ex-dividend day stock price behavior analysis. The share dividends are not considered cash equivalents as selling the shares possibly incur transaction costs and may depreciate in value during the holding period.

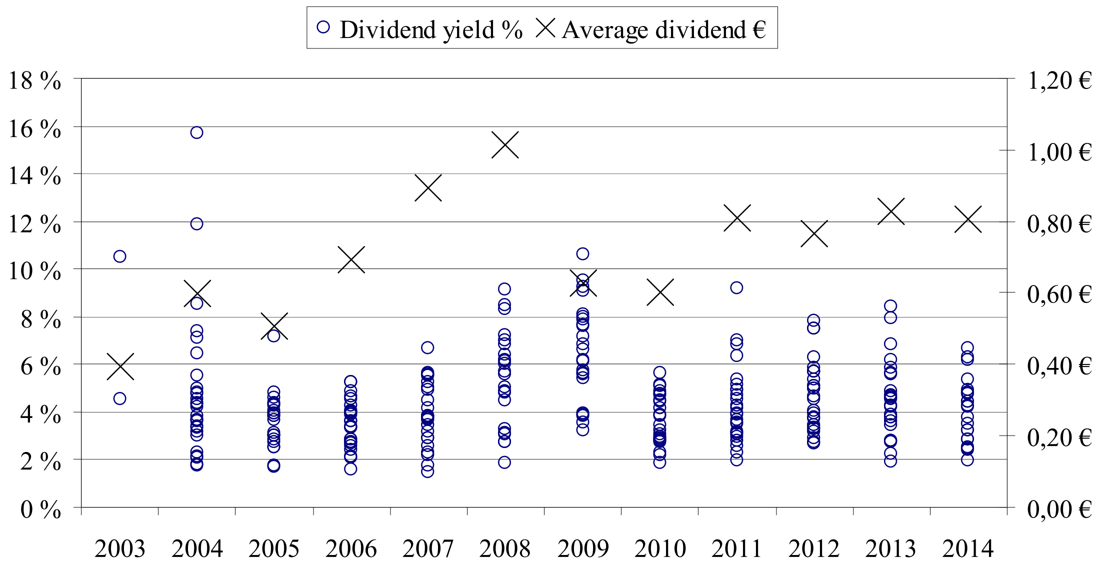


**Figure 5.** Annual dividend yields and average cash dividend 2003–2014.

Dividend yield percentages for each stock are plotted in figure 5. The tax reform of 2005 in part explains the high dividend yields of 2004 and the financial crisis of 2007–2009 depressing stock prices is affecting the yields in 2008–2009 with year 2008 seeing the highest amount of dividends paid of the study.

Figure 6 below further illustrates the impact of the financial crisis on the OMX Helsinki Benchmark_GI which is selected as the market portfolio proxy. Regarding dividends the index is a gross total return index adjusted for dividends and also for extraordinary dividends (NASDAQ OMX 2014: 14–15).


**Figure 6.** OMX Helsinki Benchmark Growth Index performance 2003–2014.

Monthly quotes of 3 month and 12 month Euribor rates are used to establish prevailing interest rates in comparison with the dividend yields during the study period. The period contains the highly volatile financial crisis of 2007–2009 and the subsequent decline in interest rates. Since the end of 2012 the interest rates have been at a historically low levels as depicted in figure 7 below.

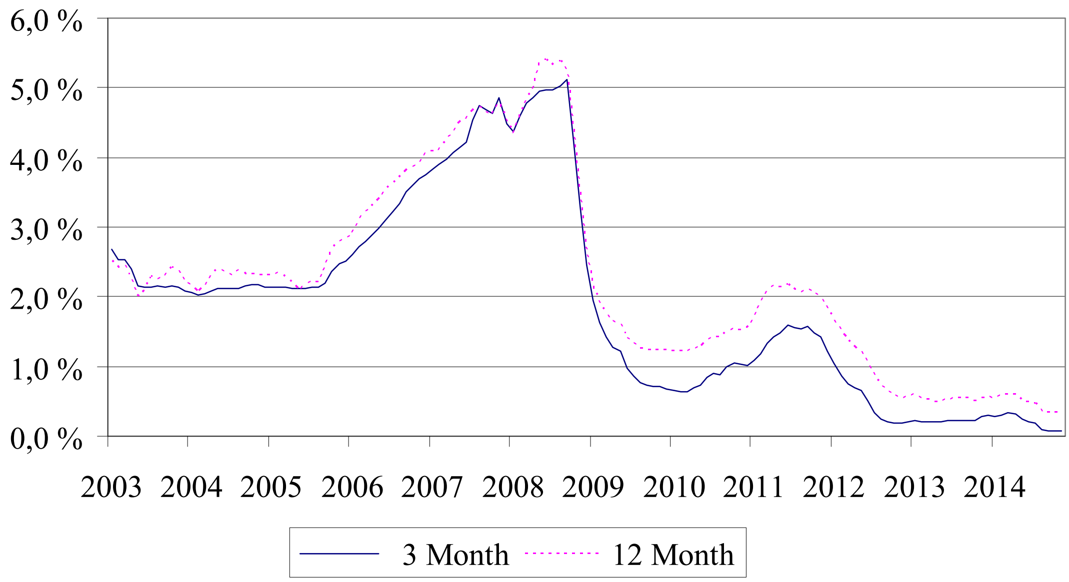


**Figure 7.** 3 month and 12 month EURIBOR interest rates for 2003–2014.

The financial crisis of 2007–2009 had its roots in the increased supply of credit in the United States following the internet and telecom stock bubble of 2000. The increasingly easy availability of mortgage finance saw house prices doubling in five years coming to June 2006. A large portion of the mortgages had insufficient collaterals and as house prices started to fall increasing amounts of homeowners defaulted on their mortgages. The individual subprime mortgages had been packaged into mortgage-backed securities and sold. Many of these structured credits were with triple-A ratings. Uncertainty in the market started to spread as these bonds started to default. As the counterparty risk grew the bond market and the short-term company borrowing effectively dried up. The crisis peaked in September 2008 with casualties such as Lehman Brothers and numerous bail-out packages and government intervention. Most developed economies were affected by the crisis and the impact on Finnish markets is evident in figures 6 and 7. (Allen et al. 2013: 366–367.)

## 4.2. The methodology

This section of the thesis is based on chapter 4 in Campbell et al. (1997: 149–180) which outlines the procedure of an event-study and the econometric methodology of event-studies. The structure of an event-study is presented in seven steps:

1. Event definition
2. Selection criteria
3. Defining normal and abnormal returns
4. Estimation procedure
5. Testing procedure
6. Empirical results
7. Interpretation and conclusions

For this chapter of the thesis the first four steps are relevant. First step is to define the event of interest and the event window. The event of interest is the ex-dividend date, the first day the shares trade without the dividend. This date is on $t = 0$. The event window is defined to capture the price effects of the cash dividend before, on, and after the ex-dividend date $t = 0$. The event window starts at $t = -20$ and ends at $t = 20$ so the 41-day event window is comprised of 20 pre-event days, the event day and 20 post-event days.

Second step is deciding which stocks to include in the study. Here a sample of 24 stocks with above average market capitalization and legal domicile in Finland is selected. The number of annual dividend distributions range from 22 to 27 and there is on average one dividend per year per stock. The stocks represent a wide range of industrial sectors on the Helsinki Stock Exchange.

The third step defines the normal return for a stock and thereafter the abnormal return. To assess the event caused abnormal return a measure of normal return must be established. The abnormal return is then the difference between the actual ex-post return of the stock and its normal return. Statistical models and economic models can be used for normal return models. MacKinlay (1997: 18–19) discusses the limited advantages of using multifactor or economic models such as the Capital Asset Pricing Model by Lintner (1965) and Sharpe (1964) or the Arbitrage Pricing Theory by Ross (1976). Two common choices for a statistical model are the constant mean return model and the market model. The market model is defined as

$$(8) \qquad R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it},$$

with $E[\varepsilon_{it}] = 0$ and $\mathrm{Var}[\varepsilon_{it}] = \sigma^2_{\varepsilon_i}$,

where $R_{it}$ is the return of stock $i$ at time $t$, $R_{mt}$ is the market return at time $t$, $\varepsilon_{it}$ is the zero mean disturbance term expected to capture the abnormal returns. $\alpha_i$, $\beta_i$ and $\sigma^2_{\varepsilon_i}$ are parameters of the market model. When estimation period is unavailable restricting the market model with constraints $\alpha_i = 0$ and $\beta_i = 1$ gives the market adjusted return model with prespecified parameters however biases may arise from false restrictions. The constant mean return model is contained in the market model in case $\beta_i = 0$ i.e. the return $R_{it}$ on security $i$ is uncorrelated with the market returns $R_{mt}$ with $\rho_{i,m} = 0$ or the variance

$\sigma_i^2$ of returns $R_i$ is zero. Then $\alpha_i = \mu_i$, with $\mu_i$ being the mean return of security $i$, the market model becomes equivalent to the constant mean model

(9) $$R_{it} = \mu_i + \varepsilon_{it}.$$

Returns $R_{it}$ and $R_{mt}$ are simple net returns or arithmetic returns as discussed in Brown & Warner (1985: 6) and Campbell et al. (1997: 9–10) and defined as

(10) $$R_t = \frac{P_t}{P_{t-1}} - 1$$

and in this study $P_t$ and $P_{t-1}$ are daily closing prices of stocks or the closing value of the market index on days $t$ and $t-1$ respectively. In this thesis the event-study is conducted using the market model for modeling the normal return.

The fourth step to follow is the estimation procedure. Estimation window for the market model is chosen here to be a subset of the data 120 days before and not overlapping the event window i.e. estimation window is from $t = -141$ to $t = -21$ and the event window is from $t = -20$ to $t = 20$. The estimation procedure presentation below follows the Campbell et al. (1997: 157–158).

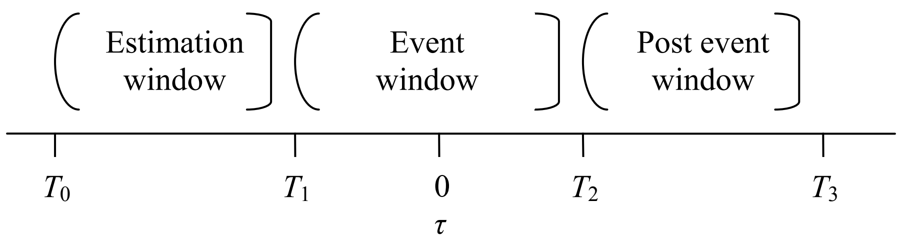


**Figure 8.** Event-study general timeline.

The post event window on the event-study timeline is used for example in Campbell & Wasley (1996: 312) when examining abnormal trading volume where one half of the estimation period is drawn from the estimation window and second half from the post event window. For this event-study however the post event window is not considered.

Following the notation used in Campbell et al. (1997: 157–159) returns in event time are indexed using $\tau$ and $\tau = 0$ is defined as the event date which is the ex-dividend date for this study. From $\tau = T_1 + 1$ to $\tau = T_2$ is the event window and $\tau = T_0 + 1$ to $\tau = T_1$ is the estimation window. Length of the estimation window is $L_1 = T_1 - T_0$ days and the length of the event window is $L_2 = T_2 - T_1$. Having $T_0 = -141$, $T_1 = -21$ and $T_2 = 20$, $L_1$ becomes 120 days and $L_2$ 41 days. When estimating the market model parameters the estimation window observations can be expressed as a regression system

(11) $$\mathbf{R}_i = \mathbf{X}_i \boldsymbol{\theta}_i + \boldsymbol{\varepsilon}_i ,$$

where $\mathbf{R}_i = \begin{bmatrix} R_{iT_0+1} \\ \vdots \\ R_{iT_1} \end{bmatrix}$, $\mathbf{X}_i = \begin{bmatrix} 1 & R_{mT_0+1} \\ \vdots & \vdots \\ 1 & R_{mT_1} \end{bmatrix}$ and $\boldsymbol{\theta}_i = \begin{bmatrix} \alpha_i \\ \beta_i \end{bmatrix}$.

In this study $\mathbf{R}_i$ is a $(120 \times 1)$ vector of estimation window returns on security $i$, $\mathbf{X}_i$ is a $(120 \times 2)$ matrix with a vector of ones in the first column and vector of estimation window market return observations $\mathbf{R}_m$ in the second column. $\boldsymbol{\theta}_i$ is a $(2 \times 1)$ parameter vector. $\boldsymbol{\varepsilon}_i$ is the $(120 \times 1)$ abnormal returns vector. With $'$ denoting a transpose of a matrix and $^{-1}$ denoting an inverse matrix, the ordinary least squares estimators of the market model parameters using estimation window length of 120 observations are

(12) $$\hat{\boldsymbol{\theta}}_i = (\mathbf{X}_i' \mathbf{X}_i)^{-1} \mathbf{X}_i' \mathbf{R}_i ,$$

(13) $$\hat{\sigma}^2_{\varepsilon_i} = \frac{1}{L_1 - 2} \hat{\boldsymbol{\varepsilon}}_i' \hat{\boldsymbol{\varepsilon}}_i ,$$

(14) $$\hat{\boldsymbol{\varepsilon}}_i = \mathbf{R}_i - \mathbf{X}_i \hat{\boldsymbol{\theta}}_i ,$$

and

(15) $$\mathrm{Var}\left[\hat{\boldsymbol{\theta}}_i\right] = (\mathbf{X}_i' \mathbf{X}_i)^{-1} \sigma^2_{\varepsilon_i} .$$

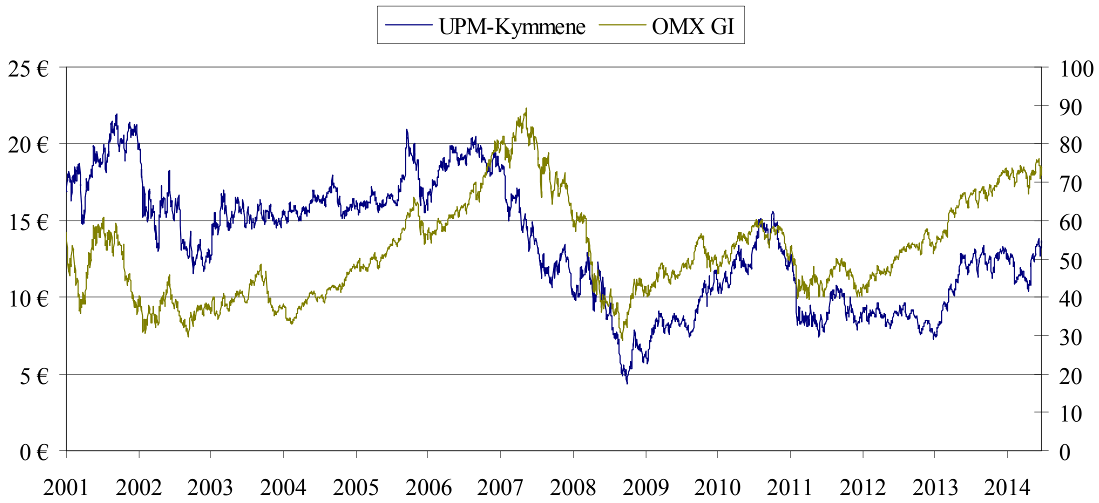


**Figure 9.** UPM-Kymmene stock price and market index 2001–2014.

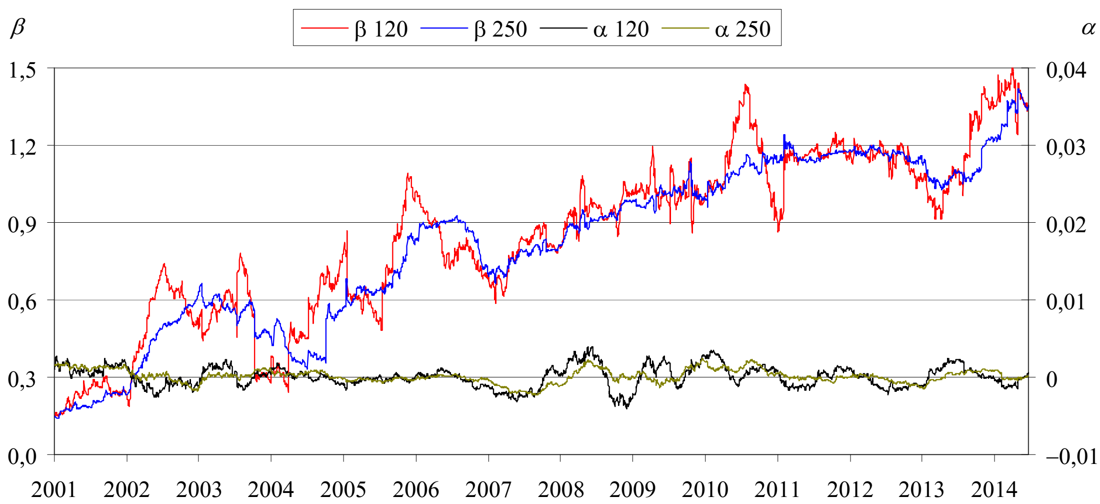


**Figure 10.** UPM-Kymmene $\alpha$ and $\beta$ using 120 and 250 observations 2001–2014.

Figures 9 and 10 above plot the UPM-Kymmene stock price and the market index covering the study period and the corresponding $\alpha$ and $\beta$ parameters for UPM-Kymmene from equation 12 estimated using 120 and 250 observations during 2001–2014. The parameter $\alpha$ benefits less than $\beta$ from the increase in the estimation window and while $\beta$ has more divergences, a 120 day estimation window is chosen for in this study to reduce the size of the data. Reducing the estimation window from 250 to 120 days effectively doubles the amount of observable ex-dividend dates.

The abnormal returns vector $\hat{\boldsymbol{\varepsilon}}_i^*$ is given by the market model, with parameter estimates $\hat{\alpha}_i$ and $\hat{\beta}_i$ and event window returns vectors $\mathbf{R}_i^*$ and $\mathbf{R}_m^*$ substituted so that

(16) $$\hat{\boldsymbol{\varepsilon}}_i^* = \mathbf{R}_i^* - \mathbf{X}_i^* \hat{\boldsymbol{\theta}}_i \ ,$$

where $\mathbf{R}_i^* = \begin{bmatrix} R_{iT_1+1} \\ \vdots \\ R_{iT_2} \end{bmatrix}$, $\mathbf{X}_i^* = \begin{bmatrix} 1 & R_{mT_1+1} \\ \vdots & \vdots \\ 1 & R_{mT_2} \end{bmatrix}$ and $\hat{\boldsymbol{\theta}}_i = \begin{bmatrix} \hat{\alpha}_i \\ \hat{\beta}_i \end{bmatrix}$.

$\mathbf{X}_i^* = \begin{bmatrix} \boldsymbol{\iota} & \mathbf{R}_m^* \end{bmatrix}$ is a (41 × 2) matrix with a vector of ones $\boldsymbol{\iota}$ in the first column and vector of event window market return observations $\mathbf{R}_m^*$ in the second column. $\mathbf{R}_i^*$ is a (41 × 1) event window security $i$ returns vector and $\hat{\boldsymbol{\theta}}_i$ is the OLS parameter vector estimate. Conditional on the market return over the event window the abnormal returns $\hat{\boldsymbol{\varepsilon}}_i^*$ will be jointly normally distributed with zero conditional mean

(17) $$E\left[\hat{\boldsymbol{\varepsilon}}_i^* \middle| \mathbf{X}_i^*\right] = 0$$

and conditional covariance matrix

(18) $$\mathbf{V}_i = \mathbf{I}\sigma_{\varepsilon_i}^2 + \mathbf{X}_i^* \left(\mathbf{X}_i' \mathbf{X}_i\right)^{-1} \mathbf{X}_i^{*\prime} \sigma_{\varepsilon_i}^2 \ ,$$

where $\mathbf{I}$ is a (41 × 41) identity matrix. The first term in the sum is the variance due to future disturbances and the second is additional variance due to the sampling error in $\hat{\boldsymbol{\theta}}_i$. As the estimation window length $L_1$ increases the additional variance approaches zero and the abnormal returns across time will become independent asymptotically (Campbell et al. 1997: 158–159.)

Fifth step of the event-study is the actual testing procedure. With the fourth step discussed in this section yielding the parameter estimates for the normal performance model, in this case the market model in equation 8, abnormal returns can be calculated and analyzed. In order to analyze the abnormal returns a testing framework for defining null hypothesis and determining the techniques for aggregating the abnormal returns of individual stocks is constructed in next chapter along with empirical results. The seventh and final step of an event-study is the interpretation of the empirical results and conclusions which will be presented in chapter 6.

# 5. EMPIRICAL RESULTS

This chapter of the thesis presents the research hypotheses, test statistics used to test the hypotheses and the empirical results. The research hypotheses $H_1$ and $H_2$ are defined as follows:

> $H_1$: *The stock price falls on ex-dividend day by an amount equal to the dividend.*

> $H_2$: *Abnormal returns are zero during the ex-dividend period.*

The first and second sections of this chapter present the test statistics and the empirical results for $H_1$ and $H_2$ respectively.

## 5.1. The ex-dividend day stock price behavior

Numerous prior studies have documented the ex-dividend day behavior of stock prices and noted the less-than-dividend price drop and more-than-dividend price drop for stocks with the highest dividend yields. Explanations such as differential tax treatment between dividends and capital gains, and market microstructure issues have been somewhat successfully proposed but no universally acceptable explanation of what determines the price drop has been found.

This section aims to establish the prevailing ex-dividend price drop ratios during 2004–2014 regarding individual stocks, dividend yields and time periods marked with different market conditions and tax regimes. The fundamental causes for the price drop ratios are not speculated however certain factors distorting the price drop ratios are discussed.

The hypothesis $H_1$ can be tested by analyzing the price drop ratio of the stock price $\Delta P/D$ which is defined as

(19) $$\Delta P/D = \frac{1}{n}\sum_{i=1}^{n}\frac{P_{it-1} - P_{it}}{D_i},$$

where the expected price drop is

(20) $$\frac{P_{t-1} - P_t}{D} = 1.$$

$P_{t-1}$ is the last cum-dividend closing price for the stock, $P_t$ is the ex-dividend closing price and $D$ is the dividend amount. In a perfect frictionless market the price drop ratio should be 1.The statistical significance of the price drop ratio is then assessed using a two-sided one-sample $t$-test with the null hypothesis $H_0$ of equation 19 equaling 1 yielding the test statistic $t_{\Delta P/D}$

(21) $$t_{\Delta P/D} = \frac{\bar{x} - 1}{\frac{\sigma}{\sqrt{n}}} \sim t(n-1),$$

where $n$ is the sample size, $\bar{x}$ is the average price drop ratio and $\sigma$ is the sample standard deviation of the price drop ratios and the test statistic $t_{\Delta P/D}$ follows the Student's $t$-distribution with $n - 1$ degrees of freedom. Results are reported at a 5% level of statistical significance. As the evidence from literature shows the stock price drop to dividend ratio varies across time, stocks, dividend yields and other variables. Price drop ratios are divided in groups according to individual stocks, dividend yield and time and then tested for null hypothesis. Table 4 below lists the average adjusted and unadjusted price drop ratios for all the individual stocks in the study. Unadjusted price drop ratios are calculated using equation 20. The adjusted price drop ratios are calculated similarly to Kalay (1982) and Michaely (1991) using the normal returns given by the market model in equation 8. The price drop ratios calculated using the modeled normal returns are referred to as $\Delta P/D$ adjusted and are defined as

(22) $$\frac{P_{t-1} - P_t + (P_{t-1} - D)(\alpha + \beta R_{mt})}{D} = 1,$$

where $(P_{t-1} - D)(\alpha + \beta R_{mt})$ is the adjustment term for the ex-dividend day market movement at $t = 0$ assumed to affect the stock price trading without the dividend component. Parameters $\alpha$ and $\beta$ are estimated with equation 12 using 120 observation of the stock and market index returns between $t = -141$ and $t = -21$.

**Table 4.** Price drop ratios by stocks.

| Stock | Mean yield | $\Delta P/D$ adjusted | $\Delta P/D$ unadjusted | Dividends |
|---|---|---|---|---|
| Amer Sports A | 3,51 % | 0,85 | 0,94 | 11 |
| Elisa | 4,89 % | **1,24*** | 1,11 | 12 |
| Fiskars | 5,47 % | 1,02 | 0,98 | 16 |
| Fortum | 5,54 % | 0,97 | 0,86 | 10 |
| Huhtamäki | 3,98 % | **0,87*** | **0,76*** | 11 |
| Kemira | 4,16 % | 0,62 | 0,47 | 11 |
| Kesko B | 5,17 % | 1,05 | 0,89 | 12 |
| Kone | 2,90 % | 0,88 | 1,00 | 11 |
| Konecranes | 3,67 % | 1,06 | 0,97 | 11 |
| Metso | 4,56 % | 0,95 | 0,96 | 11 |
| Nokia | 3,99 % | 0,90 | 0,97 | 10 |
| Nokian Renkaat | 2,68 % | 0,57 | 0,56 | 11 |
| Olvi | 3,11 % | 0,57 | **0,49*** | 11 |
| Orion B | 6,48 % | 1,18 | 1,11 | 8 |
| Rautaruukki | 5,19 % | 0,99 | 0,89 | 10 |
| Sampo A | 5,77 % | 1,03 | 0,97 | 11 |
| Sanoma | 5,62 % | 0,98 | 1,00 | 11 |
| Stockmann B | 4,14 % | 1,13 | 1,13 | 12 |
| Stora Enso R | 4,31 % | 0,86 | 0,78 | 9 |
| Tieto | 3,96 % | 0,81 | 0,77 | 12 |
| UPM-Kymmene | 5,11 % | 1,12 | 1,07 | 11 |
| Uponor | 5,10 % | 1,01 | 1,02 | 13 |
| Wärtsilä | 4,63 % | 1,27 | 1,20 | 13 |
| YIT | 4,06 % | 0,96 | 0,93 | 11 |

Table 4 above shows considerable variation in the price drop ratios between individual stocks. Price drop ratios bolded and marked with an asterisk differ from 1 at a 5% level of statistical significance. The number of dividends paid by the company during the study period and the mean dividend yield are also calculated and listed.

The differences in the adjusted and unadjusted price drop ratios, especially for the lower ratios, can be explained by relatively high positive coinciding market returns. Positive market returns decrease the price drop ratio for stocks with a positive $\beta$ and the correction term in equation 22, $(P_{t-1} - D)(\alpha + \beta R_{mt})$, increases the difference between adjusted and unadjusted price drop ratios. The results in table 4 are consistent with previous research. Stocks with high dividend yields have higher price drop ratios. This is further illustrated in table 5 below with emphasis on dividend yields.

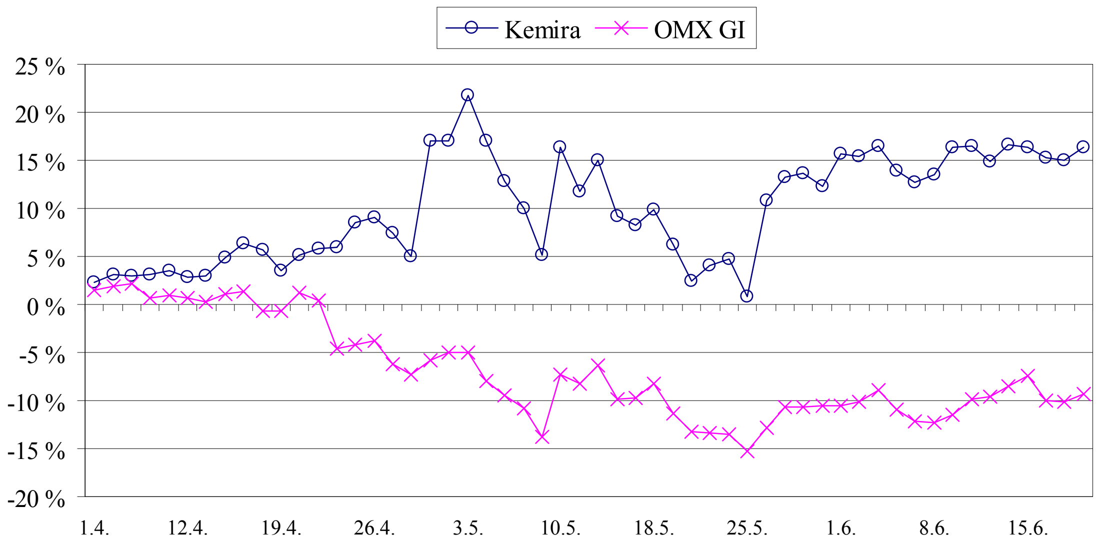


**Figure 11.** Kemira 2010 ex-dividend period stock price behavior and coinciding market volatility.

Due to the low number of observations and high variance in the price drop ratios for each stock the standard error is quite large. This allows large deviations from 1 in the average price drop ratios to not be statistically significant at any reasonable level. In the case of Kemira the low price drop ratios of 0,62 for the adjusted ratio and 0,47 for the unadjusted are largely explained by a high volatility period coinciding one single ex-dividend period. Figure 11 illustrates the movements of Kemira stock price and market index during the ex-dividend period in 2010. A 7,6% jump in the market index on the Kemira ex-day on May 10$^{th}$ 2010 and a 10,6% concurrent increase in the Kemira stock price resulted in negative price drop ratios of –1,43 for the adjusted and –3,26 for the unadjusted ratio. Excluding this exceptional dividend period of 2010 would increase the respective price drop ratios to 0,83 and 0,88.

**Table 5.** Price drop ratios by dividend yields.

| Yield | Mean yield | $\Delta P/D$ adjusted | $\Delta P/D$ unadjusted | Dividends |
|---|---|---|---|---|
| <2% | 1,79 % | 0,80 | 0,81 | 12 |
| 2%–3% | 2,61 % | 0,84 | **0,76*** | 47 |
| 3%–4% | 3,54 % | 0,89 | 0,85 | 70 |
| 4%–5% | 4,55 % | 1,01 | 1,01 | 60 |
| 5%–6% | 5,46 % | 0,95 | **0,80*** | 32 |
| 6%–7% | 6,43 % | 1,10 | 1,08 | 19 |
| 7%–8% | 7,42 % | 1,05 | 1,10 | 14 |
| >8% | 9,65 % | **1,21*** | 1,13 | 15 |

Table 5 shows the price drop ratios for dividends grouped by yield. A price drop larger than dividend for high dividend yield stocks supporting the tax induced dividend clientele theory. The 5%–6% yield range presents a curious statistically significant deviation however. Observed from the data, the top dividend yield decile had an adjusted price drop ratio of 1,15 and an unadjusted ratio of 1,12 both rejecting null hypothesis of $\Delta P/D = 1$ with p-values of 3,92% and 4,96% respectively. Similar ratios for the highest yielding stocks have been reported in previous studies regardless of the prevailing tax differences between dividends and capital gains. In Finland dividends may yield tax benefits over capital gains and price drop ratios above 1 are easier to explain than under tax regime with capital gains tax lower than dividend tax.

Elton & Gruber (1970) and Kalay (1982) and many others since have noted a positive correlation of price drop and dividend yield in their studies. This phenomenon is still observable in Finnish data from 2003–2014 despite the differences in capital income taxation and dividend practices. One interesting aspect is the definition of high dividend yield. The Finnish data contains higher single dividend payments due to the overwhelming popularity of annual dividend payments. Comparable U.S. company paying an equal annual dividend stream but in quarterly installments is categorized as a high dividend yield stock yet has comparably low dividend payments. In Michaely (1991) the top yield deciles for 1986 and 1987 are 2,45% and 2,71% respectively. The seven lowest deciles have yields under 1%. If the absolute dividend amount payable determined the ex-dividend day stock price drop ratio most Finnish companies should have high price drop ratios.

**Table 6.** Price drop ratios by year.

| Year | Dividend | Yield | 12 month Euribor | Δ*P*/*D* adjusted | Δ*P*/*D* unadjusted | Dividends |
|---|---|---|---|---|---|---|
| 2004 | 0,60 € | 4,90 % | 2,06 % | 0,90 | 0,89 | 27 |
| 2005 | 0,51 € | 3,59 % | 2,34 % | **0,80*** | **0,70*** | 22 |
| 2006 | 0,69 € | 3,48 % | 3,11 % | 0,92 | 0,95 | 26 |
| 2007 | 0,89 € | 3,93 % | 4,11 % | 1,02 | 0,92 | 25 |
| 2008 | 1,01 € | 5,39 % | 4,59 % | 1,06 | 1,08 | 23 |
| 2009 | 0,63 € | 6,58 % | 1,91 % | 0,98 | 0,87 | 23 |
| 2010 | 0,60 € | 3,66 % | 1,22 % | 0,85 | 0,72 | 23 |
| 2011 | 0,81 € | 4,32 % | 1,92 % | 0,90 | 0,83 | 25 |
| 2012 | 0,77 € | 4,76 % | 1,50 % | 1,02 | 0,93 | 26 |
| 2013 | 0,83 € | 4,55 % | 0,55 % | 1,00 | 1,01 | 24 |
| 2014 | 0,80 € | 4,12 % | 0,58 % | 1,09 | 1,14 | 23 |

The only statistically significant price drop ratios in table 6 are from year 2005 when the dividend taxation changed profoundly. Comparing yearly price drop ratios is less straightforward due to the various factors unique to each year. The most critical factor is the different behavior of price drop ratio of high and low yield stocks. Another factor is market conditions, both current and prior. 2008 and 2009 both have high dividend yields, the highest two of the sample, but are under completely different market conditions. In the aftermath of the 2007–2009 financial crisis the year 2009 has the higher yield of the two yet notably lower price drop ratio. Further considering the sample of firms is unchanged, the dividend drop from 1,01€ in 2008 to 0,63€ in 2009 and the interest rate drop from 4,59% p.a. to 1,91% p.a. are strong indicators that these periods were in fact completely unlike. As Boyd & Jagannathan (1994) point out regarding ex-day stock price behavior, there are other factors than mere dividend yield.

The tax position of an investor is affected by the amount of tax deductions from capital income and capital gains from which to deduct the expected capital losses due to the ex-day stock price drop. With available tax deductions exists tax-free income and similarly when capital gains are incurred, capital losses have a certain value decreasing the amount of tax payable. A rational investor in a frictionless market with zero taxable capital gains would prefer to receive the dividend only if the ex-day stock price fell no more than the after-tax dividend amount i.e. $\Delta P/D < 1 - T_D$. An investor who has incurred taxable capital gains would prefer to receive the dividend if the ex-day stock price falls no more than the sum of after-tax dividend and the tax savings from capital loss tax deduction due to holding the shares ex-dividend i.e. $\Delta P/D < (1 - T_D)/(1 - T_C)$. The tax rates $T_D$ and $T_C$ depend on the amount of deductions the investor can make from the dividend capital income and the capital gains from which losses can be deducted.

To calculate the tax indifferent price drop ratio $\Delta P/D$ the tax rates $T_D$ and $T_C$ need to reflect the tax rates after the effect of tax deductions. By adding multipliers $\gamma$ to the capital gains tax term $T_C$ and $\delta$ to the dividend tax term $T_D$, equation 7 then becomes

$$(23) \qquad \Delta P/D = \frac{1-\delta T_D}{1-\gamma T_C},$$

where $\delta$ is between 0 and 1 representing the percentage of taxable dividends. Investor who has a dividend tax rate $\delta T_D = 0$ has capital income tax deductions more than capital income and thus receives the full amount of the dividend. With $\delta = 0$ 0% of the dividend adds to the amount of payable capital income tax. With $\delta = 1$ none of the dividend tax can be deducted and the dividend amount received is $D(1 - T_D)$. $\gamma$ is also between 0 and 1 but represents the percentage of capital losses which can be deducted from the investors capital gains. With $\gamma = 1$ the investor is able to deduct the full ex-dividend price drop from taxable capital gains thus reducing the capital gains tax payable. Similarly an investor with zero taxable capital gains has $\gamma = 0$ and the full ex-dividend price drop realizes as a capital loss.

The price drop ratios which would make investors tax indifferent considering the prevailing tax regimes during 2003–2014 at given ratios of losses deductible from capital gains and taxable dividends are calculated and listed in tables 7 and 8. Table 7 is divided into two groups. For the first group the $\delta$ from equation 23 is 1 and $\gamma$ ranges from 0%–100% giving the tax indifferent stock price drop ratios of an investor who is able to deduct a percentage of capital losses but has to pay full dividend tax. For the second group $\gamma = 0$ and there are no tax deductions from capital losses. The price drop ratios in the table therefore present the case where investor is able to deduct 0%–100% of the dividend and none of the capital losses.

**Table 7.** Tax indifferent price drop ratios with minimum deductions 2003–2014.

| | | 2003–2004 | 2005 | 2006–2011 | Low tax bracket 2012–2013 | High tax bracket 2012–2013 | Low tax bracket 2014 | High tax bracket 2014 |
|---|---|---|---|---|---|---|---|---|
| Capital gains tax rate | | 29,0 % | 28,0 % | 28,0 % | 30,0 % | 32,0 % | 30,0 % | 32,0 % |
| Dividend tax rate | | 0,0 % | 16,0 % | 19,6 % | 21,0 % | 22,4 % | 25,5 % | 27,2 % |
| | 100 % | 1,41 | 1,17 | 1,12 | 1,13 | 1,14 | 1,06 | 1,07 |
| Percentage | 90 % | 1,35 | 1,12 | 1,07 | 1,08 | 1,09 | 1,02 | 1,02 |
| of capital | 80 % | 1,30 | 1,08 | 1,04 | 1,04 | 1,04 | 0,98 | 0,98 |
| losses | 70 % | 1,25 | 1,04 | 1,00 | 1,00 | 1,00 | 0,94 | 0,94 |
| deductible | 60 % | 1,21 | 1,01 | 0,97 | 0,96 | 0,96 | 0,91 | 0,90 |
| from | 50 % | 1,17 | 0,98 | 0,93 | 0,93 | 0,92 | 0,88 | 0,87 |
| capital gains | 40 % | 1,13 | 0,95 | 0,91 | 0,90 | 0,89 | 0,85 | 0,83 |
| with no | 30 % | 1,10 | 0,92 | 0,88 | 0,87 | 0,86 | 0,82 | 0,81 |
| dividend tax | 20 % | 1,06 | 0,89 | 0,85 | 0,84 | 0,83 | 0,79 | 0,78 |
| deductions | 10 % | 1,03 | 0,86 | 0,83 | 0,81 | 0,80 | 0,77 | 0,75 |
| | 0 % | 1,00 | 0,84 | 0,80 | 0,79 | 0,78 | 0,75 | 0,73 |
| | 100 % | 1,00 | 0,84 | 0,80 | 0,79 | 0,78 | 0,75 | 0,73 |
| Percentage | 90 % | 1,00 | 0,86 | 0,82 | 0,81 | 0,80 | 0,77 | 0,76 |
| of taxable | 80 % | 1,00 | 0,87 | 0,84 | 0,83 | 0,82 | 0,80 | 0,78 |
| dividends | 70 % | 1,00 | 0,89 | 0,86 | 0,85 | 0,84 | 0,82 | 0,81 |
| with | 60 % | 1,00 | 0,90 | 0,88 | 0,87 | 0,87 | 0,85 | 0,84 |
| no capital | 50 % | 1,00 | 0,92 | 0,90 | 0,90 | 0,89 | 0,87 | 0,86 |
| losses | 40 % | 1,00 | 0,94 | 0,92 | 0,92 | 0,91 | 0,90 | 0,89 |
| deductible | 30 % | 1,00 | 0,95 | 0,94 | 0,94 | 0,93 | 0,92 | 0,92 |
| | 20 % | 1,00 | 0,97 | 0,96 | 0,96 | 0,96 | 0,95 | 0,95 |
| | 10 % | 1,00 | 0,98 | 0,98 | 0,98 | 0,98 | 0,97 | 0,97 |
| | 0 % | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 |

Table 8 presents the case where the investor is able to deduct 100% of either dividend tax or capital losses. For the first group in table 8 the $\delta$ from equation 23 equals 0 and $\gamma$ ranges from 0%–100% giving the tax indifferent stock price drop ratios of an investor who is able to deduct a percentage of capital losses and pays no dividend tax. For the second group the $\gamma = 1$ and $\delta$ ranges from 0%–100%. The price drop ratios are for an investor who is able to deduct all capital losses but has to pay a certain percentage of the dividend tax. Comparing these theoretical maximum price drop ratios listed in tables 7 and 8 to the observed price drop ratios in tables 4, 5 and 6 shows most observed price drop ratios are well below the upper limits of the theoretical ratios. This is not in contradiction with Rantapuska's (2008) notion that investors do not always behave in a tax-optimal way.

**Table 8.** Tax indifferent price drop ratios with maximum deductions 2003–2014.

| | | 2003–2004 | 2005 | 2006–2011 | Low tax bracket 2012–2013 | High tax bracket 2012–2013 | Low tax bracket 2014 | High tax bracket 2014 |
|---|---|---|---|---|---|---|---|---|
| Capital gains tax rate | | 29,0 % | 28,0 % | 28,0 % | 30,0 % | 32,0 % | 30,0 % | 32,0 % |
| Dividend tax rate | | 0,0 % | 16,0 % | 19,6 % | 21,0 % | 22,4 % | 25,5 % | 27,2 % |
| | 0 % | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 | 1,00 |
| Percentage | 10 % | 1,03 | 1,03 | 1,03 | 1,03 | 1,03 | 1,03 | 1,03 |
| of capital | 20 % | 1,06 | 1,06 | 1,06 | 1,06 | 1,07 | 1,06 | 1,07 |
| losses | 30 % | 1,10 | 1,09 | 1,09 | 1,10 | 1,11 | 1,10 | 1,11 |
| deductible | 40 % | 1,13 | 1,13 | 1,13 | 1,14 | 1,15 | 1,14 | 1,15 |
| from | 50 % | 1,17 | 1,16 | 1,16 | 1,18 | 1,19 | 1,18 | 1,19 |
| capital gains | 60 % | 1,21 | 1,20 | 1,20 | 1,22 | 1,24 | 1,22 | 1,24 |
| with full | 70 % | 1,25 | 1,24 | 1,24 | 1,27 | 1,29 | 1,27 | 1,29 |
| dividend tax | 80 % | 1,30 | 1,29 | 1,29 | 1,32 | 1,34 | 1,32 | 1,34 |
| deductions | 90 % | 1,35 | 1,34 | 1,34 | 1,37 | 1,40 | 1,37 | 1,40 |
| | 100 % | 1,41 | 1,39 | 1,39 | 1,43 | 1,47 | 1,43 | 1,47 |
| | 0 % | 1,41 | 1,39 | 1,39 | 1,43 | 1,47 | 1,43 | 1,47 |
| Percentage | 10 % | 1,41 | 1,37 | 1,36 | 1,40 | 1,44 | 1,39 | 1,43 |
| of taxable | 20 % | 1,41 | 1,34 | 1,33 | 1,37 | 1,40 | 1,36 | 1,39 |
| dividends | 30 % | 1,41 | 1,32 | 1,31 | 1,34 | 1,37 | 1,32 | 1,35 |
| with | 40 % | 1,41 | 1,30 | 1,28 | 1,31 | 1,34 | 1,28 | 1,31 |
| all capital | 50 % | 1,41 | 1,28 | 1,25 | 1,28 | 1,31 | 1,25 | 1,27 |
| losses | 60 % | 1,41 | 1,26 | 1,23 | 1,25 | 1,27 | 1,21 | 1,23 |
| deductible | 70 % | 1,41 | 1,23 | 1,20 | 1,22 | 1,24 | 1,17 | 1,19 |
| | 80 % | 1,41 | 1,21 | 1,17 | 1,19 | 1,21 | 1,14 | 1,15 |
| | 90 % | 1,41 | 1,19 | 1,14 | 1,16 | 1,17 | 1,10 | 1,11 |
| | 100 % | 1,41 | 1,17 | 1,12 | 1,13 | 1,14 | 1,06 | 1,07 |

Table 9 below presents the price drop ratios divided into three groups according to dividend yield and to the full sample. For each group mean, standard deviation, skewness and kurtosis are calculated for both the adjusted and unadjusted price drop ratios. For normal distribution skewness and kurtosis are 0 and 3 respectively. Previous studies have indicated high price drop ratios for stock with high dividend yields. The findings in table 9 are consistent with this observation but not statistically significant. High yield segment exhibits slight signs of both negative skewness and excess kurtosis.

**Table 9.** Statistical properties of price drop ratios.

| | | $\Delta P/D$ adjusted | $\Delta P/D$ unadjusted |
|---|---|---|---|
| High yield | Mean | 1,07 | 0,99 |
| 4,9%–15,7% | StdDev | 0,37 | 0,40 |
| $n = 89$ | Skewness | –0,67 | –0,83 |
| | Kurtosis | 3,83 | 4,06 |
| Medium yield | Mean | 0,96 | 0,95 |
| 3,6%–4,9% | StdDev | 0,44 | 0,43 |
| $n = 90$ | Skewness | –1,52 | –0,88 |
| | Kurtosis | 8,92 | 6,19 |
| Low yield | Mean | **0,81*** | **0,77*** |
| 1,5%–3,6% | StdDev | 0,75 | 0,81 |
| $n = 90$ | Skewness | –0,83 | –1,24 |
| | Kurtosis | 6,32 | 10,47 |
| All | Mean | 0,94 | **0,90*** |
| 1,5%–15,7% | StdDev | 0,55 | 0,59 |
| $n = 269$ | Skewness | –1,33 | –1,60 |
| | Kurtosis | 9,05 | 14,30 |

The medium yield segment shows moderate standard deviation and stronger non-normal skewness and kurtosis than the high yield segment but has a mean indistinguishable from 1. Considering the theories of ex-day stock price drop behavior the medium segment is the least interesting segment. The effects of tax induced dividend clienteles, short-term trading and price discreteness should be most evident in the stocks with the highest and the lowest dividend yields.

The low yield segment displays a statistically significant result rejecting the research hypothesis $H_1$ of price drop ratio being 1. Both adjusted and unadjusted stock price drop to dividend ratios are statistically significant at a 5% level and less than 1. This result is consistent with numerous previous studies. Similarly to the medium yield segment the low yield sample displays non-normal skewness and excess kurtosis. All the yield segments have more or less negatively skewed distributions further supporting the notion of price drop ratios less than 1.

The unadjusted average price drop ratio of 0,9 is statistically significant at the 5% level for the full sample. The non-normal negative skewness and excess kurtosis are present also in the full sample and even slightly more pronounced. Whether examining individual stocks, dividend yield levels or time periods the price drop ratio's idiosyncrasies have become evident in this study. The factors resulting in differences between the price drop ratios, especially with Kemira and the 5%–6% dividend yield segment, may well have such simple explanation as small sample size.

## 5.2. The ex-dividend period anomaly

Eades at al. (1984) reported abnormal returns for stocks on the period before and after ex-dividend day but found no explanation for the returns. Similar findings have been reported by Lakonishok & Vermaelen (1986) and Michaely (1991) among others. Hartzmark & Solomon (2013) suggested price pressure explained the observed returns and subsequent reversals during the ex-dividend period what they termed the dividend month premium.

This section investigates the presence of abnormal returns in the ex-dividend period and it's sub-periods. The market model in equation 8 is used to model normal returns and abnormal returns are calculated from equation 16. The hypothesis to be tested is

$H_2$: *Abnormal returns are zero during the ex-dividend period.*

Testing $H_2$ is done following the event-study framework in Campbell et al. (1997: 160–173). The abnormal returns are aggregated across time and test statistics are constructed to test a null hypothesis $H_0$ of ex-dividend day having no impact on the mean or variance of the returns i.e. the ex-dividend period will have zero abnormal returns. Hartzmark & Solomon (2013) suggest that price pressure is causing the ex-dividend period abnormal returns. Assuming that price pressure has a gradual effect instead of a single large measurable impact, the abnormal returns are aggregated across time and examined using both parametric and nonparametric statistical tests.

5.2.1. Test statistics

The estimation window is length $L_1 = T_1 - T_0$ with $T_0 = -141$, $T_1 = -21$ making $L_1$ 120 days and the event window set as $L_2 = T_2 - T_1$ where $T_1 = -21$ and $T_2 = 20$ and $L_2$ length is 41 days. Under the null hypothesis $H_0$ the vector of event window sample of abnormal returns $\hat{\boldsymbol{\varepsilon}}_i^*$ from equation 16 follows normal distribution with expected mean zero from equation 17 and variance from equation 18 so that

$$(24) \qquad \hat{\boldsymbol{\varepsilon}}_i^* \sim N(0, \mathbf{V}_i).$$

The abnormal returns are first aggregated across time for an individual security with $\mathrm{CAR}_i(\tau_1, \tau_2)$ as the cumulative abnormal return for stock $i$ for a period from $\tau_1$ to $\tau_2$ where $T_1 < \tau_1 \leq \tau_2 \leq T_2$. Vector $\boldsymbol{\gamma}$ is $(41 \times 1)$ with ones in positions $\tau_1 - T_1$ to $\tau_2 - T_1$ and zeros elsewhere. $\mathrm{CAR}_i(\tau_1, \tau_2)$ is defined as

$$(25) \qquad \mathrm{CAR}_i(\tau_1, \tau_2) = \boldsymbol{\gamma}' \hat{\boldsymbol{\varepsilon}}_i^*$$

with variance

$$(26) \qquad \mathrm{Var}[\mathrm{CAR}_i(\tau_1, \tau_2)] = \sigma_i^2(\tau_1, \tau_2) = \boldsymbol{\gamma}' \mathbf{V}_i \boldsymbol{\gamma}.$$

Following from equation 24 and the null hypothesis $H_0$ $\mathrm{CAR}_i(\tau_1, \tau_2)$ is normally distributed with zero mean and variance $\sigma_i^2(\tau_1, \tau_2)$

$$(27) \qquad \mathrm{CAR}_i(\tau_1, \tau_2) \sim N\left(0, \sigma_i^2(\tau_1, \tau_2)\right).$$

Standardized cumulative abnormal return $\mathrm{SCAR}_i(\tau_1, \tau_2)$ for stock $i$ and period from $\tau_1$ to $\tau_2$ is defined as

$$(28) \qquad \mathrm{SCAR}_i(\tau_1, \tau_2) = \frac{\mathrm{CAR}_i(\tau_1, \tau_2)}{\hat{\sigma}_i(\tau_1, \tau_2)},$$

where $\hat{\sigma}_i(\tau_1, \tau_2)$ is calculated from equation 26 with $\hat{\sigma}_{\varepsilon_i}^2$ from equation 13 substituted for $\sigma_{\varepsilon_i}^2$ in equation 18. Next the abnormal returns are aggregated across securities. The cumulative average abnormal return $\mathrm{CAAR}(\tau_1, \tau_2)$ for period from $\tau_1$ to $\tau_2$ with $n$ observations is defined as

$$(29) \qquad \mathrm{CAAR}(\tau_1, \tau_2) = \frac{1}{n}\sum_{i=1}^{n} \mathrm{CAR}_i(\tau_1, \tau_2)$$

with variance

$$(30) \qquad \mathrm{Var}\left[\mathrm{CAAR}(\tau_1, \tau_2)\right] = \bar{\sigma}^2(\tau_1, \tau_2) = \frac{1}{n^2}\sum_{i=1}^{n} \sigma_i^2(\tau_1, \tau_2)$$

and normally distributed under the null hypothesis

$$(31) \qquad \mathrm{CAAR}(\tau_1, \tau_2) \sim N\left(0, \bar{\sigma}^2(\tau_1, \tau_2)\right).$$

Since $\bar{\sigma}^2(\tau_1, \tau_2)$ is unknown $\hat{\bar{\sigma}}^2(\tau_1, \tau_2)$ is used as a consistent estimator instead and

(32) $$\hat{\bar{\sigma}}^2(\tau_1,\tau_2)=\frac{1}{n^2}\sum_{i=1}^{n}\hat{\sigma}_i^2(\tau_1,\tau_2),$$

where $\hat{\sigma}_i^2(\tau_1,\tau_2)$ is calculated from equation 26 with $\hat{\sigma}_{\varepsilon_i}^2$ from equation 13 substituted for $\sigma_{\varepsilon_i}^2$ in equation 18. With the estimator of variance $\hat{\bar{\sigma}}^2(\tau_1,\tau_2)$ the test statistic for cumulative average abnormal return for the null hypothesis is

(33) $$J_1=\frac{\mathrm{CAAR}(\tau_1,\tau_2)}{\left[\hat{\bar{\sigma}}^2(\tau_1,\tau_2)\right]^{\frac{1}{2}}}\overset{a}{\sim}N(0,1).$$

The test statistic $J_1$ is for large sample and not exact due to the estimator of variance in the denominator. Second method of testing the null hypothesis suggested by Patell (1976) is aggregating the individual standardized cumulative abnormal returns from equation 28. The average standardized cumulative abnormal return $\mathrm{ASCAR}(\tau_1,\tau_2)$ is defined as

(34) $$\mathrm{ASCAR}(\tau_1,\tau_2)=\frac{1}{n}\sum_{i=1}^{n}\mathrm{SCAR}_i(\tau_1,\tau_2).$$

Under $H_0$ $\mathrm{ASCAR}(\tau_1,\tau_2)$ will be normally distributed in large samples with mean zero and variance $\left(\frac{L_1-2}{n(L_1-4)}\right)$. The test statistic for null hypothesis is

(35) $$J_2=\left(\frac{n(L_1-4)}{L_1-2}\right)^{\frac{1}{2}}\mathrm{ASCAR}(\tau_1,\tau_2)\overset{a}{\sim}N(0,1).$$

Assuming price pressure causes the ex-dividend period abnormal returns and the effect is gradual $J_2$ should have higher power detecting the abnormal return. Hartzmark & Solomon (2013) however find the subsequent returns reversal after ex-day are related to cum-dividend stock price increases. $J_1$ should have more power detecting after ex-day abnormal returns assuming higher volatility for stronger reversals.

Both the test statistics $J_1$ and $J_2$ test the null hypothesis that the event has no effect on mean or variance of the returns. To concentrate only on the mean effect of the event the reliance on past returns in estimating the variance of the aggregated cumulative abnormal returns need to be eliminated. Boehmer, Musumeci & Poulsen (1991) discuss a method where cross section of cumulative abnormal returns can be used to form an estimator of variance and this approach can be applied to both the cumulative average abnormal return $\mathrm{CAAR}(\tau_1, \tau_2)$ in equation 33 and the average standardized cumulative abnormal return $\mathrm{ASCAR}(\tau_1, \tau_2)$ in equation 35. The variance estimator for test statistic $J_{1\mathrm{BMP}}$ for $\mathrm{CAAR}(\tau_1, \tau_2)$ is

(36) $$\mathrm{Var}[\mathrm{CAAR}(\tau_1, \tau_2)] = \frac{1}{n^2}\sum_{i=1}^{n}\left(\mathrm{CAR}_i(\tau_1, \tau_2) - \mathrm{CAAR}(\tau_1, \tau_2)\right)^2$$

and the variance estimator for test statistic $J_{2\mathrm{BMP}}$ for $\mathrm{ASCAR}(\tau_1, \tau_2)$ is

(37) $$\mathrm{Var}[\mathrm{ASCAR}(\tau_1, \tau_2)] = \frac{1}{n^2}\sum_{i=1}^{n}\left(\mathrm{SCAR}_i(\tau_1, \tau_2) - \mathrm{ASCAR}(\tau_1, \tau_2)\right)^2 .$$

Two nonparametric test statistics are also included. First testing the presence of positive abnormal returns associated with the ex-dividend period. For null hypothesis that the probability of a positive abnormal return is 50% $H_0$: $Pr(\mathrm{CAR}_i \geq 0) \leq 0{,}5$ and alternative hypothesis $H_1$: $Pr(\mathrm{CAR} \geq 0) > 0{,}5$, regardless of size, the test statistic $J_3$ is

(38) $$J_3 = \left[\frac{n^+}{n} - 0{,}5\right]\frac{n^{\frac{1}{2}}}{0{,}5} \overset{a}{\sim} N(0,1),$$

where $n$ is the sample size and $n^+$ is the number of positive abnormal return observations. If the true distribution of positive and negative abnormal returns is skewed the test statistic $J_3$ becomes misspecified. The second nonparametric test ranks the abnormal returns according to size assigning the largest rank to the highest return and rank 1 to the lowest return with $K_{i\tau}$ being the rank of firm $i$ at time $\tau$ during event window length $L_2$ from $T_1$ + 1 to $T_2$. Expected rank under the null hypothesis of the event having no effect on return behavior is ($L_2$ +1)/2 and the test statistic is

$$(39) \qquad J_4 = \frac{\frac{1}{n}\sum_{i=1}^{n}\left(K_{i0} - \frac{L_2+1}{2}\right)}{\sqrt{\frac{1}{L_2}\sum_{\tau=T_1+1}^{T_2}\left(\frac{1}{n}\sum_{i=1}^{n}\left(K_{i\tau} - \frac{L_2+1}{2}\right)\right)^2}} \overset{a}{\sim} N(0,1).$$

Abnormal returns for the ex-dividend period are illustrated using the buy-and-hold approach in Barber & Lyon (1997: 344). As returns $\mathrm{CAR}_i(\tau_1, \tau_2)$ and $\mathrm{CAAR}(\tau_1, \tau_2)$ are arithmetic means of daily returns they assume the portfolio is balanced to equal weights after each one-day period. With respect to cumulative abnormal returns the buy-and-hold approach gives further information regarding the time-series returns behavior of individual stocks. An equally weighted portfolio is constructed using time $t$ = –21 closing prices. The buy-and-hold average abnormal returns BHAAR illustrate the development of an unbalanced portfolio during the ex-dividend period but is not used for statistical inference. BHAAR is defined for $n$ stocks and time from –20 to $\tau_2$ as

$$(40) \qquad \mathrm{BHAAR}(-20, \tau_2) = \sum_{i=1}^{n}\left(\prod_{t=-20}^{\tau_2}(1 + R_{it}) - \prod_{t=-20}^{\tau_2}(1 + \alpha_i + \beta_i R_{mt})\right).$$

5.2.2. The ex-dividend period abnormal returns

The ex-dividend period is dividend into 9 segments, the ex-day and eight five day sub-periods. For each segment the abnormal returns are aggregated and tested with the methodology reviewed above. The study period is divided into four time periods based on taxation and market conditions. The time periods are 2003–2004, 2005–2008, 2009–2011 and 2012–2014. The financial crisis of 2007–2009 is used to divide periods 2005–2008 and 2009–2011, other periods have differing tax regimes regarding dividends and capital gains as listed in table 1.

**Table 10.** Ex-dividend period abnormal returns 2003–2014.

| $(\tau_1, \tau_2)$ | –20– –16 | –15– –11 | –10– –6 | –5– –1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,32% | 0,41% | 0,09% | 0,43% | 0,02% | –0,63% | 0,05% | 0,03% | 0,66% |
| BHAAR $(-20, \tau_2)$ | 0,32% | 0,68% | 0,71% | 1,08% | 1,09% | 0,42% | 0,45% | 0,46% | 1,14% |
| $J_1$ | 1,36 | 1,71 | 0,36 | 1,79 | 0,24 | **–2,63** | 0,23 | 0,14 | **2,77** |
| p-value | 17,4% | 8,8% | 72,1% | 7,4% | 81,2% | 0,9% | 82,2% | 89,0% | 0,6% |
| $J_{1BMP}$ | 1,50 | **2,14** | 0,45 | 1,85 | 0,18 | **–3,23** | 0,27 | 0,14 | **2,60** |
| p-value | 13,2% | 3,2% | 65,1% | 6,5% | 86,0% | 0,1% | 78,6% | 88,5% | 0,9% |
| $J_2$ | 1,40 | 1,63 | 0,39 | **1,97** | –0,01 | **–3,56** | –0,04 | –0,39 | **2,63** |
| p-value | 16,2% | 10,4% | 69,9% | 4,9% | 98,9% | 0,0% | 97,0% | 69,5% | 0,8% |
| $J_{2BMP}$ | 1,43 | 1,88 | 0,46 | **2,02** | –0,01 | **–3,79** | –0,04 | –0,38 | **2,34** |
| p-value | 15,2% | 6,0% | 64,3% | 4,3% | 99,1% | 0,0% | 96,9% | 70,4% | 1,9% |
| $J_3$ | 1,07 | 0,30 | –1,34 | 1,83 | –0,18 | **–4,41** | **–2,22** | –1,07 | –1,23 |
| p-value | 28,6% | 76,3% | 18,0% | 6,7% | 85,4% | 0,0% | 2,7% | 28,6% | 21,8% |
| $J_4$ | 1,07 | 0,72 | –0,12 | **2,15** | –0,29 | **–3,02** | –0,65 | –0,67 | 0,65 |
| p-value | 28,4% | 47,4% | 90,3% | 3,2% | 77,5% | 0,2% | 51,7% | 50,1% | 51,3% |
| Number of dividends | 267 | | Mean yield | 4,51 % | σ(AAR) | 1,714 % | Period | 14.3. 2003 | 18.6. 2014 |

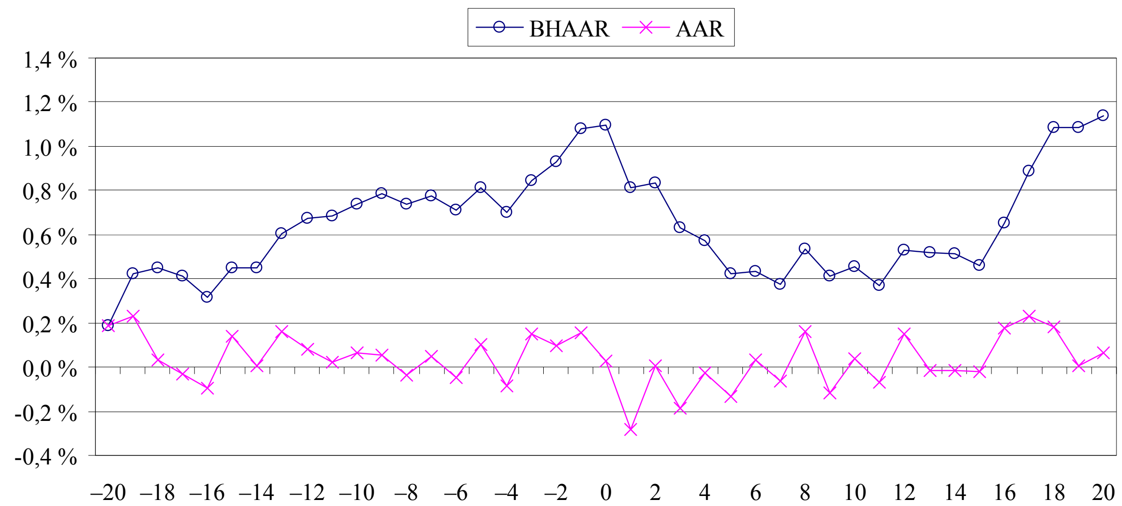


**Figure 12.** Ex-dividend period abnormal returns 2003–2014.

Table 10 depicts the statistical significance of cumulative average abnormal returns, $\mathrm{CAAR}(\tau_1, \tau_2)$, for the nine sub-periods of the ex-dividend period for the full study sample from 2003–2014 with 267 ex-dividend period observations. BHAAR (–20, $\tau_2$) represents the non-balancing portfolio performance through the ex-dividend period. The test statistics and corresponding p-values are listed and figures statistically significant at 5% level are bolded. According to table 10 the ex-dividend sub-periods –5—1, 1–5 and 16–20 have statistically significant abnormal returns of 0,43%, –0,63% and 0,66% respectively as indicated by the test statistic $J_2$.

Figure 12 above plots the BHAAR portfolio returns and the daily average abnormal return AAR during the ex-dividend period. BHAAR shows the cum-dividend period positive returns, the price reversal on ex-day and the statistically significant positive returns in the final sub-period. Figure 13 below illustrates the very slight volatility changes of the AAR during the ex-dividend period.

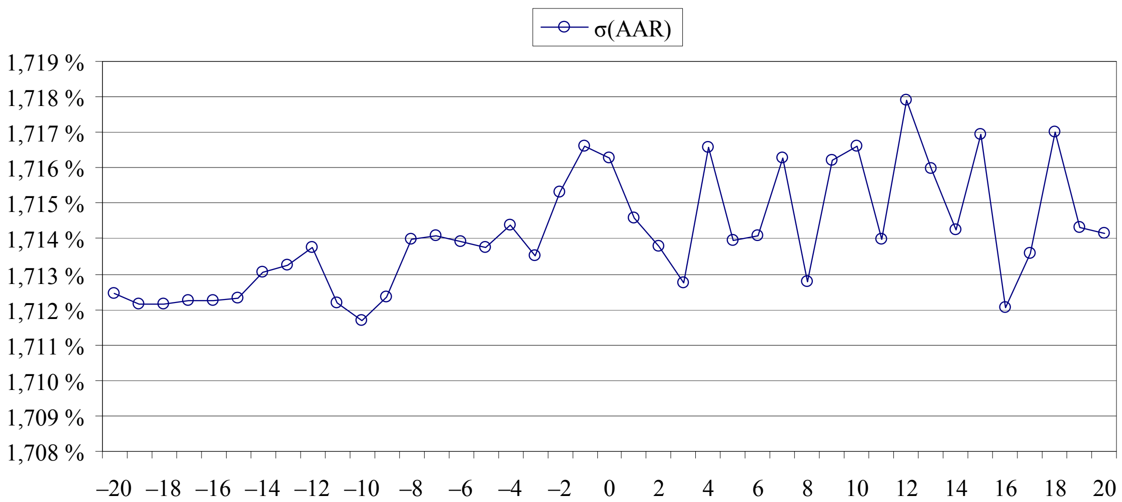


**Figure 13.** Ex-dividend period daily average abnormal return volatility 2003–2014.

The statistical significance of the ex-dividend period returns are assessed using both parametric and nonparametric statistical tests. Figure 14 presents the comparative performance of parametric test statistics $J_1$ and $J_2$ and the nonparametric test statistics $J_3$ and $J_4$ using the AAR full sample data of the study. Despite few divergences, namely with returns on days 16 and 18, the test statistics are consistent with each other with the full data sample. All test statistics also indicate a <1% level of statistical significance for returns on day 1, the first day after the ex-day. $J_2$ will be used as the main test statistic and rest for supportive statistics for statistical inference in the study.

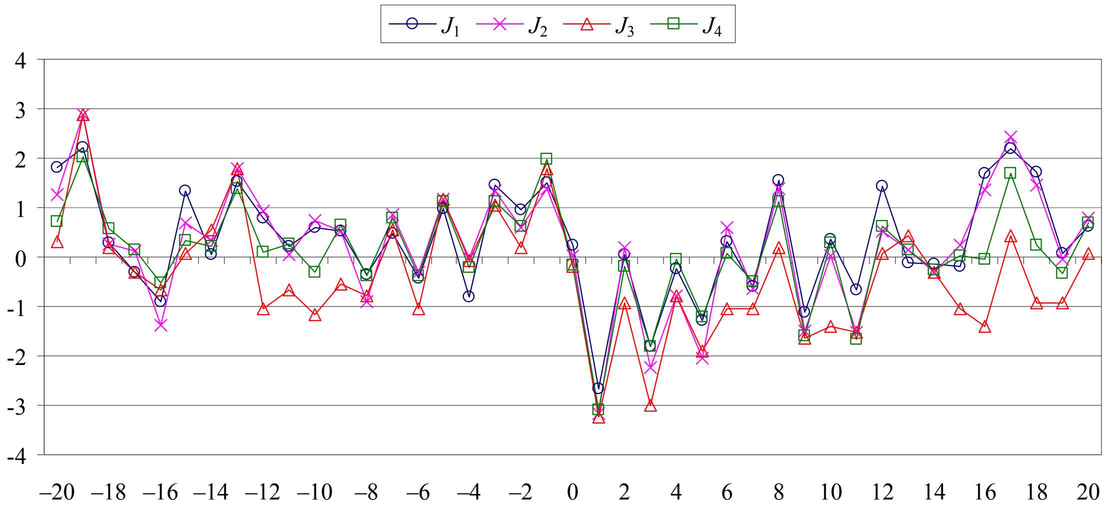


**Figure 14.** Comparison of parametric and nonparametric test statistics.

The full sample is next divided into two groups of 120 highest and lowest yield ex-dividend period observations. Table 11 below shows statistically significant negative returns for the combined sub-period of 0 and 1–5 and statistically significant positive returns in the final sub-period 16–20. The BHAAR return for ex-dividend period is 2,39% compared to the full sample's 1,14% suggesting higher ex-dividend period returns for high dividend yield stocks which is further illustrated in figure 15 below.

The difference in the returns with BHAAR of 1,79% and CAAR of 1,95% for the period –20 to –1 is due to the differences in returns of individual stocks during the period as BHAAR calculates the time-series returns and CAAR is the sum of means of arithmetic returns. Depending on the returns CAAR may overestimate or underestimate the BHAAR. Stocks with positive returns during the ex-dividend period have higher weight in BHAAR whereas all returns have equal weight under CAAR.

The ex-dividend day $\tau = 0$ negative abnormal return is consistent with the stock price drop ratio of 1,07 reported in table 9. A –0,34% return with 6,12% mean dividend yield reported in table 11 corresponds to a price drop ratio $\Delta P/D$ of 1,06. The statistical significance of $\Delta P/D$ in table 9 was estimated using a t-test and 89 observed $\Delta P/D$-ratios arriving at a p-value of 9,7% which is also consistent with the observable p-values of the various test statistics in table 11.

**Table 11.** Ex-dividend period abnormal returns high yield 2003–2014.

| ($\tau_1$, $\tau_2$) | –20––16 | –15––11 | –10––6 | –5––1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR ($\tau_1$, $\tau_2$) | 0,56% | 0,59% | 0,19% | 0,61% | –0,34% | –0,55% | 0,42% | 0,08% | 1,00% |
| BHAAR (–20, $\tau_2$) | 0,56% | 1,08% | 1,20% | 1,79% | 1,43% | 0,87% | 1,32% | 1,35% | 2,39% |
| $J_1$ | 1,47 | 1,53 | 0,51 | 1,59 | **–2,04** | –1,43 | 1,11 | 0,21 | **2,63** |
| p-value | 14,0% | 12,5% | 61,1% | 11,2% | 4,1% | 15,3% | 26,7% | 83,1% | 0,8% |
| $J_{1BMP}$ | 1,59 | 1,94 | 0,65 | 1,49 | –1,61 | –1,65 | 1,31 | 0,23 | **2,50** |
| p-value | 11,3% | 5,3% | 51,8% | 13,5% | 10,7% | 9,8% | 19,0% | 82,1% | 1,3% |
| $J_2$ | 1,78 | 1,38 | 0,22 | **2,30** | **–2,39** | **–2,22** | 1,30 | 0,08 | **2,71** |
| p-value | 7,6% | 16,9% | 82,5% | 2,2% | 1,7% | 2,6% | 19,2% | 93,3% | 0,7% |
| $J_{2BMP}$ | 1,69 | 1,61 | 0,28 | **2,16** | –1,66 | **–2,09** | 1,37 | 0,08 | **2,47** |
| p-value | 9,1% | 10,7% | 78,1% | 3,0% | 9,8% | 3,6% | 17,0% | 93,3% | 1,3% |
| $J_3$ | 1,31 | 0,57 | –0,98 | 1,71 | **–2,37** | –1,88 | 0,00 | 0,00 | –0,08 |
| p-value | 19,1% | 56,8% | 32,7% | 8,6% | 1,8% | 6,0% | 100% | 100% | 93,5% |
| $J_4$ | 0,58 | –0,54 | –0,39 | 1,47 | –1,03 | **–2,00** | –0,41 | –0,18 | 1,94 |
| p-value | 56,4% | 59,2% | 69,4% | 14,2% | 30,4% | 4,6% | 67,9% | 85,7% | 5,3% |
| Number of dividends | 120 | | Mean yield | 6,12 % | σ(AAR) | 1,838 % | Period | 14.3. 2003 | 18.6. 2014 |

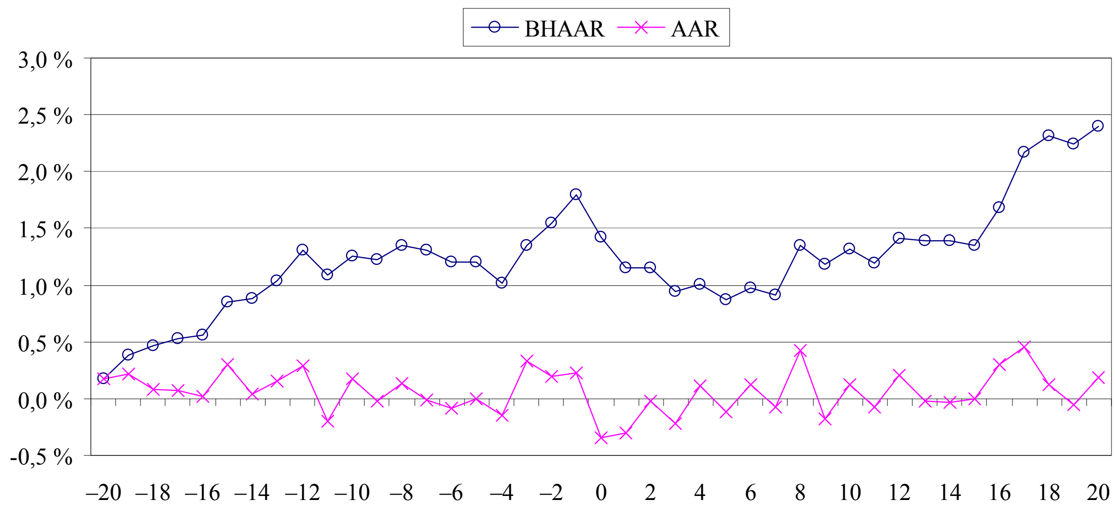


**Figure 15.** Ex-dividend period abnormal returns high yield 2003–2014.

Observed from the data the period from –20—1 has CAAR of 1,95% having all parametric tests with p-values <2% while the individual 5-day periods show no such returns. Days 8 and 17 also have statistically significant positive returns of 0,423% and 0,458% respectively. The ex-dividend period is positive for the high yield stocks.

**Table 12.** Ex-dividend period abnormal returns low yield 2003–2014.

| $(\tau_1, \tau_2)$ | –20––16 | –15––11 | –10––6 | –5––1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,18% | 0,16% | –0,00% | 0,24% | 0,31% | –0,70% | –0,19% | –0,14% | 0,26% |
| BHAAR $(–20, \tau_2)$ | 0,18% | 0,31% | 0,27% | 0,41% | 0,72% | –0,05% | –0,29% | –0,45% | –0,21% |
| $J_1$ | 0,55 | 0,48 | –0,01 | 0,71 | **2,12** | **–2,10** | –0,57 | –0,41 | 0,77 |
| p-value | 58,3% | 63,0% | 99,3% | 47,9% | 3,4% | 3,6% | 57,1% | 68,2% | 44,0% |
| $J_{1BMP}$ | 0,65 | 0,57 | –0,01 | 0,82 | 1,93 | **–2,84** | –0,69 | –0,44 | 0,75 |
| p-value | 51,4% | 56,5% | 99,2% | 41,0% | 5,4% | 0,5% | 48,9% | 65,7% | 45,3% |
| $J_2$ | 0,22 | 0,52 | 0,19 | 0,26 | **2,15** | **–2,61** | –0,98 | –0,80 | 0,79 |
| p-value | 82,2% | 60,5% | 85,0% | 79,2% | 3,1% | 0,9% | 32,6% | 42,6% | 42,8% |
| $J_{2BMP}$ | 0,26 | 0,57 | 0,21 | 0,30 | 1,91 | **–3,22** | –0,99 | –0,81 | 0,71 |
| p-value | 79,8% | 56,8% | 83,0% | 76,2% | 5,6% | 0,1% | 32,4% | 41,6% | 47,6% |
| $J_3$ | 0,00 | 0,00 | –0,90 | 0,16 | **2,01** | **–3,76** | **–2,61** | –0,73 | –1,14 |
| p-value | 100% | 100% | 36,9% | 87,0% | 4,5% | 0,0% | 0,9% | 46,2% | 25,3% |
| $J_4$ | 1,23 | 1,55 | –0,08 | 1,29 | 1,74 | **–2,67** | –0,25 | –0,86 | –1,00 |
| p-value | 21,7% | 12,0% | 93,2% | 19,7% | 8,1% | 0,8% | 79,9% | 39,3% | 31,6% |
| Number of dividends | 120 | | Mean yield | 2,97 % | σ(AAR) | 1,608 % | Period | 5.3. 2004 | 25.4. 2014 |

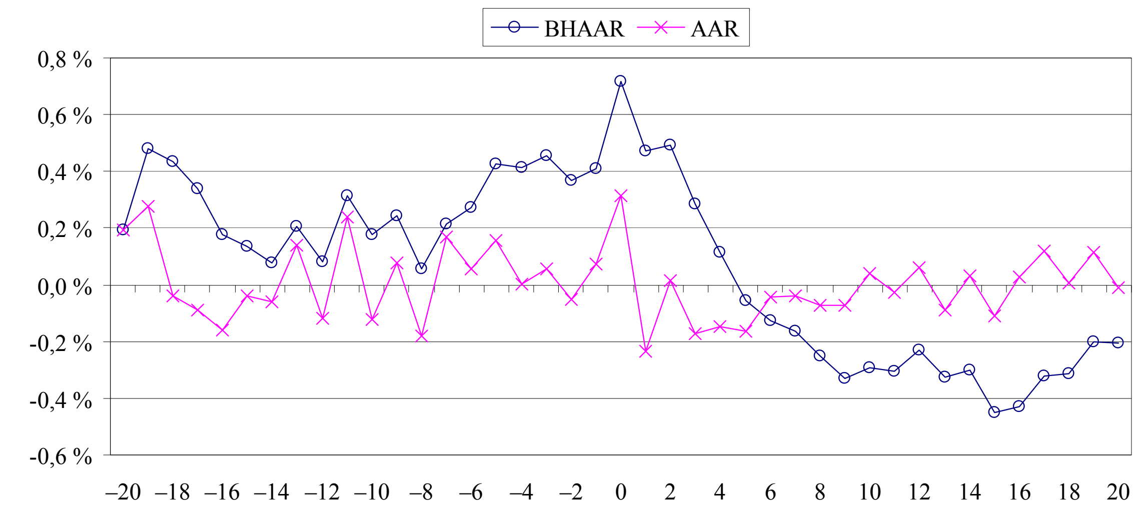


**Figure 16.** Ex-dividend period abnormal returns low yield 2003–2014.

Table 12 shows negative abnormal returns for period 1–5 and positive for the ex-day. Also period 1–10 has a statistically significant negative return of –0,89%. Considering the mean yield of 2,97% the 0,31% abnormal return on ex-day corresponds to a $\Delta P/D$ of 0,90 compared to a $\Delta P/D$ of 0,81 in table 9 and both ratios are statistically significant.

With the absence of positive return sub-periods other than the ex-day and the negative overall BHAAR combined with the smaller daily returns the ex-dividend period is very different for the low yield stocks than for the high yield stocks. No significant value seem to be attached to the ex-dividend period prior to ex-day of low yield stocks.

**Table 13.** Ex-dividend period abnormal returns high yield 2003–2004.

| $(\tau_1, \tau_2)$ | –20– –16 | –15– –11 | –10– –6 | –5– –1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 1,50% | –0,35% | –0,70% | 0,53% | –0,94% | –0,72% | 1,38% | 1,35% | 0,80% |
| BHAAR $(-20, \tau_2)$ | 1,57% | 1,19% | 0,43% | 0,96% | –0,07% | –0,91% | 0,44% | 1,73% | 2,53% |
| $J_1$ | 1,72 | –0,40 | –0,80 | 0,61 | **–2,44** | –0,82 | 1,57 | 1,53 | 0,92 |
| p-value | 8,5% | 69,0% | 42,1% | 54,4% | 1,5% | 41,1% | 11,6% | 12,6% | 36,0% |
| $J_{1BMP}$ | 1,30 | –0,70 | –1,85 | 0,69 | –1,66 | –0,79 | 1,75 | 1,36 | 1,19 |
| p-value | 19,3% | 48,2% | 6,4% | 48,8% | 9,7% | 43,0% | 8,0% | 17,5% | 23,4% |
| $J_2$ | 2,08 | –0,51 | –0,73 | 1,00 | **–3,37** | –1,05 | 1,36 | 1,47 | 0,90 |
| p-value | 3,8% | 60,8% | 46,6% | 31,9% | 0,1% | 29,4% | 17,2% | 14,3% | 36,6% |
| $J_{2BMP}$ | 1,19 | –0,86 | –1,64 | 1,29 | –2,13 | –0,77 | 1,55 | 1,33 | 1,01 |
| p-value | 23,6% | 38,9% | 10,1% | 19,7% | 3,3% | 44,0% | 12,1% | 18,4% | 31,5% |
| $J_3$ | 1,73 | –0,81 | –1,27 | 1,50 | **–2,32** | –0,81 | –0,58 | 0,35 | –0,81 |
| p-value | 8,3% | 41,9% | 20,4% | 13,3% | 2,0% | 41,9% | 56,4% | 72,9% | 41,9% |
| $J_4$ | 1,32 | –1,23 | 0,05 | 0,46 | –0,62 | –0,31 | 0,64 | 0,03 | –0,68 |
| p-value | 18,6% | 21,8% | 95,7% | 64,6% | 53,3% | 76,0% | 52,3% | 97,8% | 49,4% |
| Number of dividends | 15 | | Mean yield | 7,02 % | σ(AAR) | 1,494 % | Period | 14.3. 2003 | 9.12. 2004 |

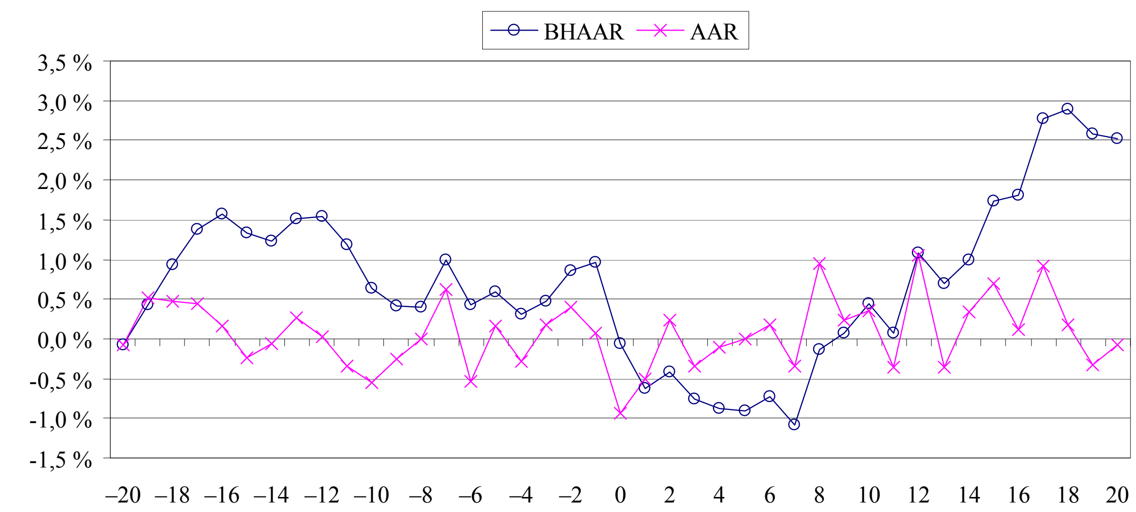


**Figure 17.** Ex-dividend period abnormal returns high yield 2003–2004.

Table 13 above shows abnormal returns only for the ex-day. Figure 17 suggests that there is a price reversal after ex-day and positive returns on subsequent periods but due to small sample size they are not statistically significant. The same small sample issue is evident in table 14 below also with relatively high returns but alas high p-values.

**Table 14.** Ex-dividend period abnormal returns low yield 2003–2004.

| $(\tau_1, \tau_2)$ | –20––16 | –15––11 | –10––6 | –5––1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | –1,49% | 0,78% | –1,29% | 1,16% | 0,74% | 0,25% | –0,80% | 0,09% | 0,70% |
| BHAAR $(-20, \tau_2)$ | –1,49% | –0,72% | –2,05% | –0,92% | –0,22% | –0,14% | –1,04% | –0,89% | –0,09% |
| $J_1$ | –1,55 | 0,81 | –1,34 | 1,20 | 1,72 | 0,26 | –0,83 | 0,09 | 0,72 |
| p-value | 12,2% | 41,6% | 18,0% | 22,8% | 8,6% | 79,5% | 40,4% | 92,8% | 46,9% |
| $J_{1BMP}$ | –1,64 | 0,98 | –1,63 | 1,13 | 1,75 | 0,36 | –1,23 | 0,07 | 0,69 |
| p-value | 10,1% | 32,9% | 10,3% | 26,0% | 8,0% | 72,2% | 22,0% | 94,2% | 49,0% |
| $J_2$ | –1,54 | 1,14 | –0,93 | 1,11 | 1,33 | –0,12 | –1,62 | –0,08 | 0,21 |
| p-value | 12,3% | 25,6% | 35,1% | 26,7% | 18,3% | 90,6% | 10,6% | 94,0% | 83,4% |
| $J_{2BMP}$ | –1,63 | 1,43 | –1,10 | 1,03 | 1,59 | –0,13 | –1,67 | –0,06 | 0,19 |
| p-value | 10,4% | 15,3% | 27,1% | 30,3% | 11,2% | 89,3% | 9,5% | 95,1% | 84,8% |
| $J_3$ | –1,91 | 0,96 | –1,20 | –0,24 | 1,07 | –0,24 | –1,20 | –0,96 | –0,72 |
| p-value | 5,6% | 33,9% | 23,2% | 81,1% | 28,5% | 81,1% | 23,2% | 33,9% | 47,3% |
| $J_4$ | –0,17 | 2,13 | 0,11 | 0,44 | 1,84 | –0,60 | –0,72 | –0,29 | –1,73 |
| p-value | 86,6% | 3,3% | 91,1% | 66,0% | 6,6% | 55,0% | 47,2% | 77,2% | 8,4% |
| Number of dividends | 14 | | Mean yield | 3,00 % | σ(AAR) | 1,586 % | Period | 5.3. 2004 | 2.12. 2004 |

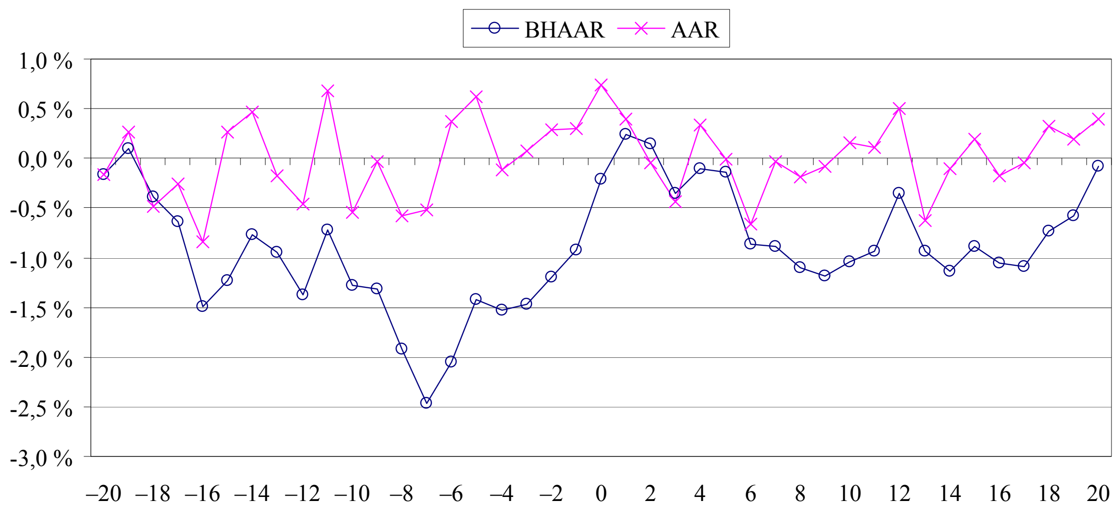


**Figure 18.** Ex-dividend period abnormal returns low yield 2003–2004.

**Table 15.** Ex-dividend period abnormal returns high yield 2005–2008.

| $(\tau_1, \tau_2)$ | –20– –16 | –15– –11 | –10– –6 | –5– –1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,67% | 1,51% | 1,00% | 1,93% | 0,24% | –0,12% | 0,15% | –0,55% | 0,44% |
| BHAAR $(-20, \tau_2)$ | 0,66% | 2,06% | 2,94% | 4,82% | 5,06% | 4,92% | 5,02% | 4,31% | 4,61% |
| $J_1$ | 1,19 | **2,66** | 1,78 | **3,42** | 0,96 | –0,22 | 0,27 | –0,97 | 0,78 |
| p-value | 23,4% | 0,8% | 7,6% | 0,1% | 33,5% | 82,8% | 78,4% | 33,3% | 43,5% |
| $J_{1BMP}$ | 1,05 | **3,11** | **2,14** | **3,56** | 0,82 | –0,27 | 0,30 | –1,07 | 0,83 |
| p-value | 29,5% | 0,2% | 3,2% | 0,0% | 41,5% | 78,5% | 76,8% | 28,4% | 40,4% |
| $J_2$ | 0,85 | **2,57** | 1,57 | **3,20** | 1,67 | –0,79 | 0,08 | –1,55 | 0,66 |
| p-value | 39,3% | 1,0% | 11,7% | 0,1% | 9,5% | 43,1% | 93,6% | 12,1% | 50,6% |
| $J_{2BMP}$ | 0,77 | **2,92** | 1,74 | **3,09** | 1,15 | –0,98 | 0,08 | –1,65 | 0,62 |
| p-value | 44,3% | 0,3% | 8,2% | 0,2% | 25,0% | 32,6% | 93,3% | 10,0% | 53,7% |
| $J_3$ | 0,46 | 1,11 | 0,46 | **2,81** | –0,15 | –1,50 | –0,59 | –1,37 | –0,07 |
| p-value | 64,8% | 26,7% | 64,8% | 0,5% | 88,4% | 13,4% | 55,7% | 17,1% | 94,8% |
| $J_4$ | 0,00 | 0,57 | 0,00 | **2,34** | –0,02 | –1,73 | –1,29 | –1,51 | 1,63 |
| p-value | 100% | 57,0% | 99,6% | 1,9% | 98,3% | 8,3% | 19,7% | 13,1% | 10,3% |
| Number of dividends | 47 | | Mean yield | 5,32 % | σ(AAR) | 1,704 % | Period | 16.3. 2005 | 16.4. 2008 |

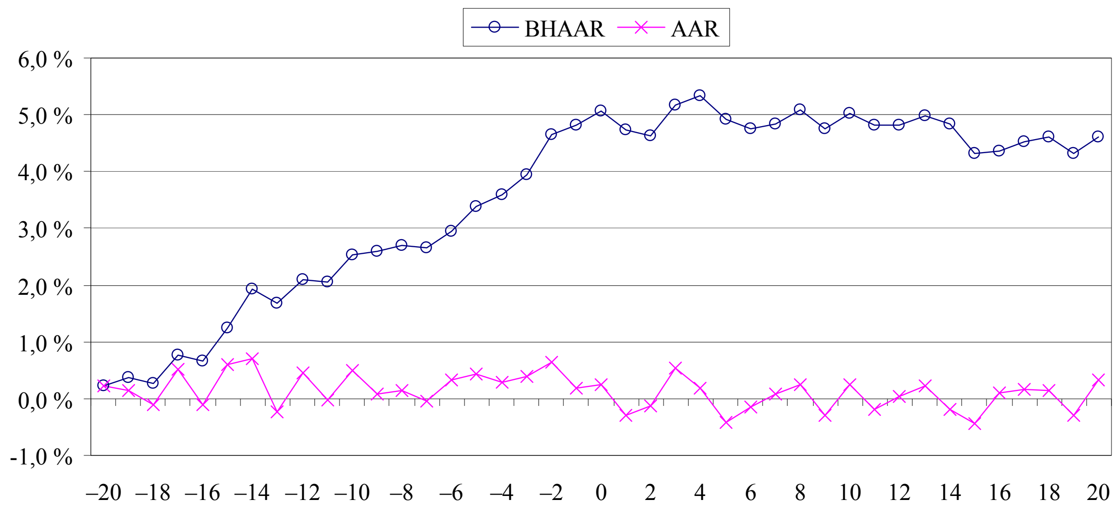


**Figure 19.** Ex-dividend period abnormal returns high yield 2005–2008.

Figure 19 shows large statistically significant returns leading up to the ex-day but unlike the full sample there is no reversal drop for period 1–5 and no large positive returns for the end periods. The BHAAR (–20, 0) of 5,06% is close to the mean dividend yield of 5,32%. The period has 6 statistically significant daily AAR's all of which are positive.

**Table 16.** Ex-dividend period abnormal returns low yield 2005–2008.

| ($\tau_1$, $\tau_2$) | –20–<br>–16 | –15–<br>–11 | –10–<br>–6 | –5–<br>–1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR ($\tau_1$, $\tau_2$) | 0,39% | 0,22% | 0,33% | 0,19% | 0,12% | –0,67% | –0,20% | –0,70% | 0,40% |
| BHAAR (–20, $\tau_2$) | 0,39% | 0,59% | 0,92% | 1,02% | 1,14% | 0,39% | 0,19% | –0,56% | –0,13% |
| $J_1$ | 0,78 | 0,45 | 0,65 | 0,37 | 0,54 | –1,34 | –0,40 | –1,39 | 0,80 |
| p-value | 43,7% | 65,5% | 51,8% | 71,1% | 58,6% | 18,0% | 68,7% | 16,6% | 42,4% |
| $J_{1BMP}$ | 0,83 | 0,55 | 0,68 | 0,49 | 0,66 | **–2,10** | –0,47 | –1,73 | 0,69 |
| p-value | 40,6% | 58,4% | 49,3% | 62,7% | 51,2% | 3,6% | 64,1% | 8,4% | 49,1% |
| $J_2$ | 0,29 | 0,43 | 0,80 | 0,39 | 0,82 | –1,78 | –0,38 | **–2,01** | 1,60 |
| p-value | 77,2% | 67,0% | 42,1% | 69,5% | 41,0% | 7,5% | 70,5% | 4,4% | 11,0% |
| $J_{2BMP}$ | 0,34 | 0,44 | 0,78 | 0,49 | 0,91 | **–2,51** | –0,32 | **–2,15** | 1,22 |
| p-value | 73,5% | 66,3% | 43,8% | 62,2% | 36,0% | 1,2% | 74,6% | 3,2% | 22,2% |
| $J_3$ | –0,20 | 1,11 | –0,07 | 1,37 | 1,31 | **–2,28** | –1,76 | –0,46 | –0,59 |
| p-value | 84,5% | 26,7% | 94,8% | 17,1% | 18,9% | 2,2% | 7,8% | 64,8% | 55,7% |
| $J_4$ | 0,42 | 0,42 | 0,51 | 1,88 | 1,83 | –1,50 | –0,08 | **–2,05** | –0,42 |
| p-value | 67,5% | 67,1% | 60,7% | 6,1% | 6,7% | 13,4% | 93,7% | 4,0% | 67,1% |
| Number of dividends | 47 | | Mean yield | 2,86 % | σ(AAR) | 1,519 % | Period | 11.3. 2005 | 9.5. 2008 |

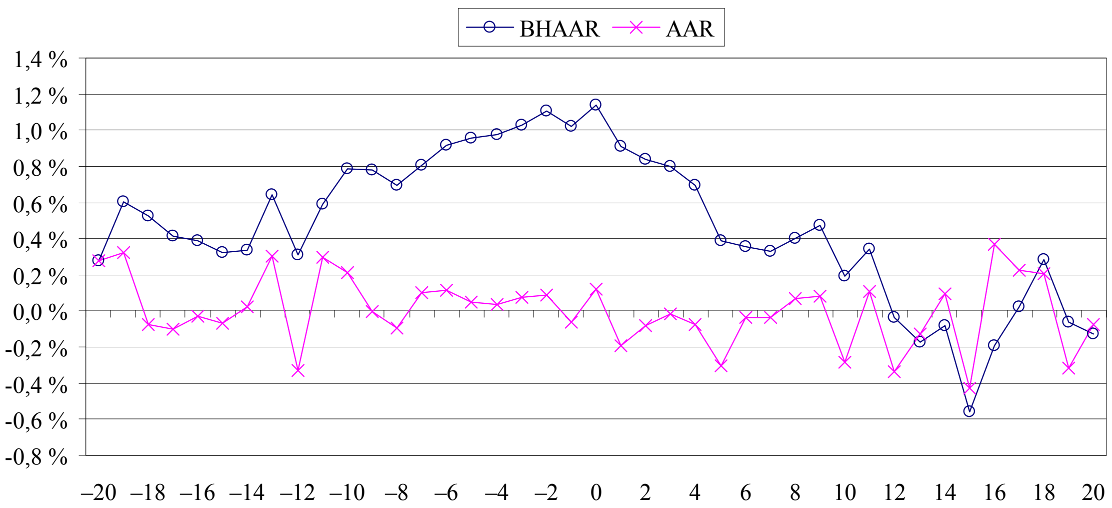


**Figure 20.** Ex-dividend period abnormal returns low yield 2005–2008.

Although not statistically significant the reversal in BHAAR suggests there is limited value in the dividend. The period 1–5 drop is similar to the full sample in figure 9 with parametric test statistics $J_{1BMP}$ and $J_{2BMP}$ and the nonparametric $J_3$ indicating statistical significance. Period 11–15 return has some support from statistics $J_{2BMP}$ and $J_4$ to $J_2$.

**Table 17.** Ex-dividend period abnormal returns high yield 2009–2011.

| $(\tau_1, \tau_2)$ | –20– –16 | –15– –11 | –10– –6 | –5– –1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,21% | 0,40% | 0,39% | –0,75% | –0,82% | –1,40% | 0,80% | –0,25% | 2,15% |
| BHAAR $(–20, \tau_2)$ | 0,18% | 0,52% | 0,82% | 0,03% | –0,88% | –2,19% | –1,35% | –1,45% | 1,06% |
| $J_1$ | 0,24 | 0,45 | 0,45 | –0,86 | **–2,14** | –1,61 | 0,92 | –0,28 | **2,47** |
| p-value | 80,8% | 65,0% | 65,2% | 38,7% | 3,2% | 10,7% | 35,9% | 77,9% | 1,4% |
| $J_{1BMP}$ | 0,33 | 0,64 | 0,65 | –0,82 | –1,72 | –1,83 | 1,38 | –0,30 | 1,90 |
| p-value | 74,3% | 52,3% | 51,4% | 41,5% | 8,6% | 6,7% | 16,9% | 76,7% | 5,8% |
| $J_2$ | 0,48 | 0,24 | 0,40 | –0,50 | **–2,80** | **–2,95** | 1,37 | –0,82 | **2,76** |
| p-value | 62,8% | 81,2% | 69,0% | 61,5% | 0,5% | 0,3% | 17,2% | 41,4% | 0,6% |
| $J_{2BMP}$ | 0,66 | 0,28 | 0,56 | –0,48 | **–1,99** | **–2,39** | 1,54 | –0,81 | 1,92 |
| p-value | 50,9% | 77,9% | 57,7% | 62,9% | 4,7% | 1,7% | 12,5% | 41,8% | 5,4% |
| $J_3$ | 0,60 | 0,00 | –1,19 | 0,00 | –1,67 | **–2,24** | 0,15 | –0,30 | 0,45 |
| p-value | 55,1% | 100,0% | 23,3% | 100,0% | 9,6% | 2,5% | 88,1% | 76,6% | 65,5% |
| $J_4$ | 0,22 | –0,51 | 0,27 | 0,31 | –1,09 | –1,62 | 0,47 | –0,11 | 1,45 |
| p-value | 82,2% | 61,3% | 78,4% | 76,0% | 27,7% | 10,6% | 64,0% | 91,1% | 14,8% |
| Number of dividends | 36 | | Mean yield | 6,42 % | σ(AAR) | 2,299 % | Period | 12.3. 2009 | 4.5. 2011 |

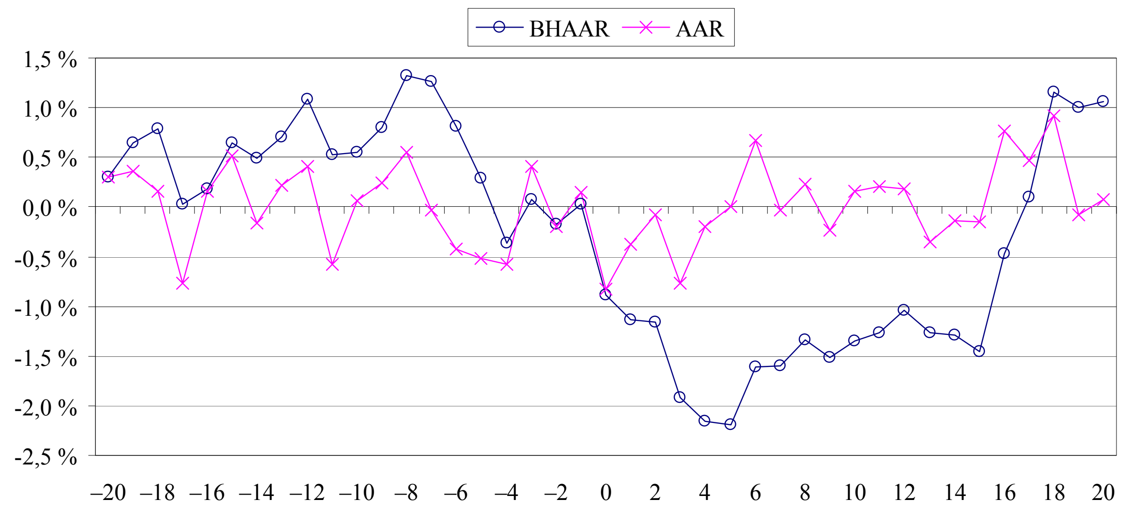


**Figure 21.** Ex-dividend period abnormal returns high yield 2009–2011.

Table 17 has the only sub-period –5—1 in the study with a negative return which suggests dividend aversion. Although the return is not statistically significant it is exceptional in this study. The strong negative returns at ±5 days around the ex-day are reversed by over +2% returns on both BHAAR and CAAR at the final period 16–20.

**Table 18.** Ex-dividend period abnormal returns low yield 2009–2011.

| $(\tau_1, \tau_2)$ | –20–<br>–16 | –15–<br>–11 | –10–<br>–6 | –5–<br>–1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,48% | 0,86% | 0,21% | 0,33% | 0,85% | –1,00% | 0,07% | 0,76% | 0,66% |
| BHAAR $(–20, \tau_2)$ | 0,45% | 1,30% | 1,39% | 1,54% | 2,46% | 1,30% | 1,23% | 2,07% | 2,72% |
| $J_1$ | 0,66 | 1,19 | 0,30 | 0,46 | **2,66** | –1,38 | 0,09 | 1,06 | 0,91 |
| p-value | 50,8% | 23,5% | 76,6% | 64,4% | 0,8% | 16,6% | 92,5% | 29,1% | 36,1% |
| $J_{1BMP}$ | 0,93 | 1,46 | 0,46 | 0,51 | **2,00** | –1,76 | 0,13 | 0,99 | 1,20 |
| p-value | 35,0% | 14,4% | 64,4% | 61,1% | 4,5% | 7,9% | 89,4% | 32,4% | 23,1% |
| $J_2$ | 0,74 | 1,30 | 0,48 | 0,28 | **2,36** | –1,41 | –0,28 | 1,33 | 1,02 |
| p-value | 46,1% | 19,3% | 62,9% | 78,2% | 1,8% | 15,9% | 77,6% | 18,3% | 30,6% |
| $J_{2BMP}$ | 0,88 | 1,51 | 0,75 | 0,30 | 1,81 | –1,58 | –0,38 | 1,15 | 1,30 |
| p-value | 37,8% | 13,2% | 45,6% | 76,6% | 7,0% | 11,3% | 70,2% | 25,0% | 19,2% |
| $J_3$ | 0,53 | –0,08 | 0,38 | 0,38 | 0,85 | **–2,65** | –1,74 | 0,38 | 0,23 |
| p-value | 59,7% | 94,0% | 70,5% | 70,5% | 39,8% | 0,8% | 8,2% | 70,5% | 82,1% |
| $J_4$ | 0,82 | 1,92 | 0,44 | –0,02 | –0,28 | **–2,43** | –0,37 | –0,18 | –0,07 |
| p-value | 41,4% | 5,4% | 65,7% | 98,6% | 78,1% | 1,5% | 70,9% | 85,4% | 94,8% |
| Number of dividends | 35 | | Mean yield | 3,21 % | σ(AAR) | 1,876 % | Period | 24.2. 2009 | 24.10. 2011 |

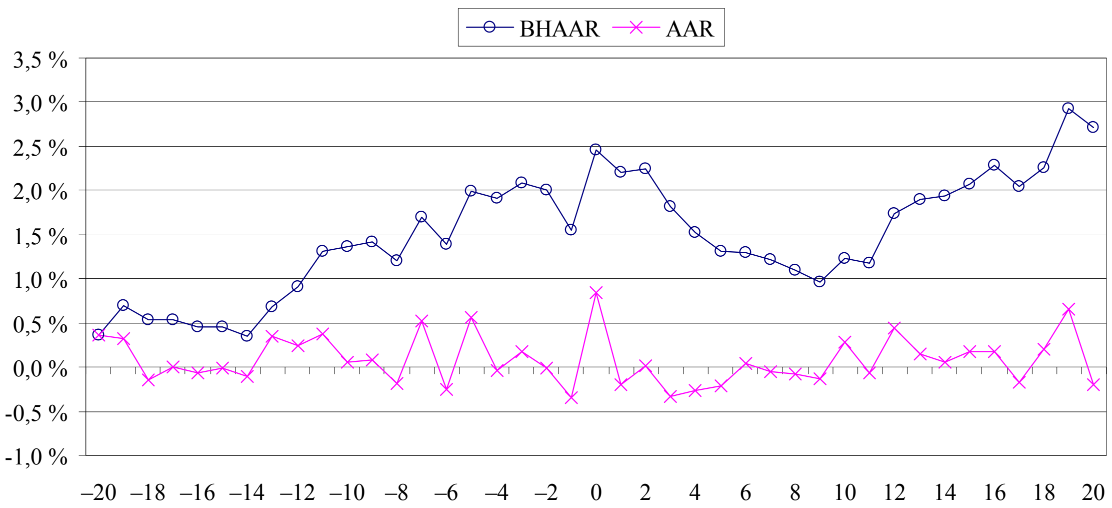


**Figure 22.** Ex-dividend period abnormal returns low yield 2009–2011.

While the high yield stocks in 2009–2011 had –0,82% abnormal return on ex-day with +0,73% CAAR and +1,06% BHAAR for the whole ex-dividend period, the low yield stocks had+0,85% returns on ex-day, +3,22% CAAR and +2,72% BHAAR. 2009–2011 is the only period in the study where low yield stocks outperform high yield stocks.

**Table 19.** Ex-dividend period abnormal returns high yield 2012–2014.

| $(\tau_1, \tau_2)$ | –20–<br>–16 | –15–<br>–11 | –10–<br>–6 | –5–<br>–1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,08% | 0,33% | –0,78% | 0,14% | –0,23% | –0,46% | –0,18% | 0,52% | 0,74% |
| BHAAR $(-20, \tau_2)$ | 0,09% | 0,42% | –0,35% | –0,20% | –0,38% | –0,94% | –1,02% | –0,59% | 0,14% |
| $J_1$ | 0,14 | 0,62 | –1,44 | 0,26 | –0,98 | –0,86 | –0,34 | 0,96 | 1,38 |
| p-value | 88,7% | 53,7% | 14,9% | 79,3% | 32,7% | 39,2% | 73,3% | 33,8% | 16,9% |
| $J_{1BMP}$ | 0,15 | 0,72 | –1,52 | 0,25 | –0,98 | –1,11 | –0,33 | 0,99 | 1,39 |
| p-value | 87,8% | 46,9% | 12,8% | 80,5% | 32,8% | 26,5% | 74,1% | 32,0% | 16,5% |
| $J_2$ | 0,27 | 0,95 | –1,24 | 0,62 | –1,43 | –0,61 | –0,03 | 1,18 | 1,42 |
| p-value | 78,9% | 34,3% | 21,5% | 53,5% | 15,4% | 54,1% | 97,6% | 23,8% | 15,6% |
| $J_{2BMP}$ | 0,30 | 1,13 | –1,47 | 0,58 | –1,29 | –0,69 | –0,03 | 1,09 | 1,38 |
| p-value | 76,8% | 25,9% | 14,1% | 55,9% | 19,7% | 48,9% | 97,6% | 27,8% | 16,8% |
| $J_3$ | –0,30 | 0,60 | –1,04 | 0,15 | –1,00 | –0,60 | 0,15 | 0,15 | –0,45 |
| p-value | 76,6% | 55,1% | 29,7% | 88,1% | 31,7% | 55,1% | 88,1% | 88,1% | 65,5% |
| $J_4$ | –0,13 | 0,26 | –1,27 | 0,96 | **–2,05** | –1,09 | –0,46 | 1,05 | 1,59 |
| p-value | 89,9% | 79,6% | 20,3% | 33,5% | 4,1% | 27,5% | 64,3% | 29,3% | 11,1% |
| Number of dividends | 36 | | Mean yield | 5,70 % | σ(AAR) | 1,419 % | Period | 15.3. 2012 | 18.6. 2014 |

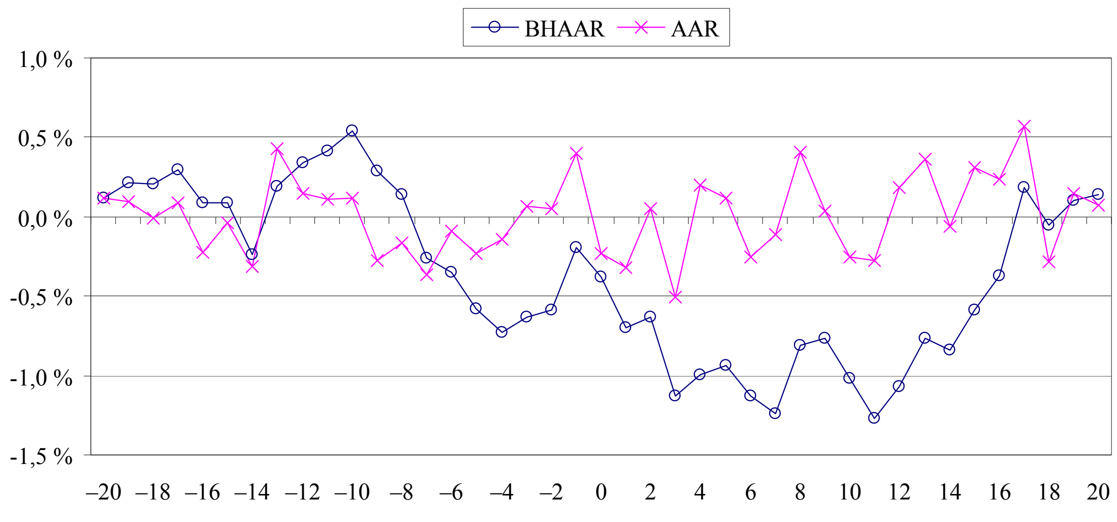


**Figure 23.** Ex-dividend period abnormal returns high yield 2012–2014.

Similarly to figure 21 the high yield 2012–2014 BHAAR has price reversals before and after the ex-day. Daily returns are also smaller and less volatile than in 2009–2011. There are no statistically significant abnormal returns on any sub-period however the end of the period exhibits some positive returns bringing the BHAAR up to 0,14%.

**Table 20.** Ex-dividend period abnormal returns low yield 2012–2014.

| $(\tau_1, \tau_2)$ | –20– –16 | –15– –11 | –10– –6 | –5– –1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| CAAR $(\tau_1, \tau_2)$ | 0,14% | –0,99% | –0,05% | 0,01% | –0,00% | –0,47% | –0,53% | 0,28% | –0,30% |
| BHAAR $(–20, \tau_2)$ | 0,13% | –0,90% | –0,98% | –1,04% | –1,06% | –1,47% | –2,07% | –1,83% | –2,22% |
| $J_1$ | 0,25 | –1,72 | –0,09 | 0,02 | –0,02 | –0,81 | –0,92 | 0,49 | –0,51 |
| p-value | 80,3% | 8,6% | 92,8% | 98,2% | 98,7% | 41,9% | 35,6% | 62,2% | 60,8% |
| $J_{1BMP}$ | 0,39 | **–2,75** | –0,13 | 0,03 | –0,08 | –0,99 | –1,08 | 0,68 | –0,52 |
| p-value | 70,0% | 0,6% | 89,6% | 97,6% | 93,3% | 32,4% | 27,9% | 49,4% | 60,0% |
| $J_2$ | 0,50 | –1,90 | –0,07 | –0,47 | 0,11 | –0,85 | –0,79 | 0,48 | –1,24 |
| p-value | 61,9% | 5,7% | 94,3% | 64,2% | 90,9% | 39,5% | 42,7% | 63,2% | 21,4% |
| $J_{2BMP}$ | 0,63 | **–2,93** | –0,10 | –0,53 | 0,10 | –0,98 | –0,93 | 0,61 | –1,36 |
| p-value | 52,8% | 0,3% | 92,0% | 59,7% | 92,4% | 32,8% | 35,3% | 54,1% | 17,4% |
| $J_3$ | 1,64 | **–2,53** | –0,60 | –1,19 | 0,67 | –1,34 | –0,60 | –0,45 | –1,94 |
| p-value | 10,1% | 1,1% | 55,1% | 23,3% | 50,5% | 18,0% | 55,1% | 65,5% | 5,3% |
| $J_4$ | 1,27 | –0,98 | –0,34 | –0,02 | 0,01 | –0,26 | 0,14 | 0,99 | –0,82 |
| p-value | 20,3% | 32,9% | 73,1% | 98,4% | 99,1% | 79,7% | 88,6% | 32,4% | 41,4% |
| Number of dividends | | 36 | Mean yield | 3,29 % | σ(AAR) | 1,521 % | Period | 6.2. 2012 | 25.4. 2014 |

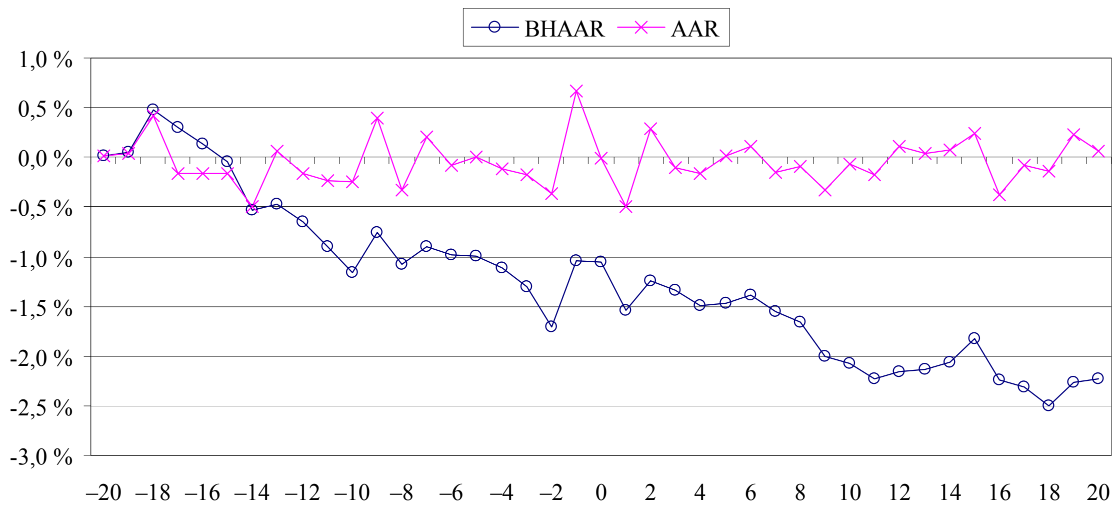


**Figure 24.** Ex-dividend period abnormal returns low yield 2012–2014.

Table 20 shows negative return of –0,99% for period –15—11 with $J_{1BMP}$, $J_{2BMP}$ and $J_3$ rejecting the null hypothesis but with the main test statistic $J_2$ being slightly above the rejection limit. The last cum-dividend day $t = –1$ has a statistically significant return of 0,67% for low yield stocks and not statistically significant 0,40% for high yield stocks.

The ex-dividend period for low yield stocks in 2012–2014 with CAAR –1,90% and BHAAR –2,22% is the worst in the study. Despite the positive day $t = -1$ returns the dividend seems to have a negative affect on the low dividend yield stocks which is possibly due to the closing taxation gap between dividends and capital gains.

**Table 21.** Sub-period abnormal return signs.

| $(\tau_1, \tau_2)$ | –20– –16 | –15– –11 | –10– –6 | –5– –1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| –2004 High | + | – | – | + | **–*** | – | + | + | + |
| –2004 Low | – | + | – | + | + | + | – | + | + |
| 2005–2008 High | + | **+*** | + | **+*** | + | – | + | – | + |
| 2005–2008 Low | + | + | + | + | + | – | – | **–*** | + |
| 2009–2011 High | + | + | + | **–*** | **–*** | – | + | – | **+*** |
| 2009–2011 Low | + | + | + | + | **+*** | – | + | + | + |
| 2012–2014 High | + | + | – | + | – | – | – | + | + |
| 2012–2014 Low | + | – | – | + | – | – | – | + | – |
| 2003–2014 High | + | + | + | **+*** | **–*** | **–*** | + | + | **+*** |
| 2003–2014 Low | + | + | – | + | **+*** | **–*** | – | – | + |
| 2003–2014 Total | + | + | + | **+*** | + | **–*** | + | + | **+*** |

Table 21 presents the return signs for each period with statistically significant returns bolded and marked with an asterisk. Abnormal return were detected in the full sample for ex-dividend sub-periods –5—1, 1–5 and 16–20. Dividing the full sample in high and low yield groups reveals the returns on ex-dividend day are also statically significant for both groups only in opposite directions.

Table 22 presents the returns for each sub-period. Statistically significant returns are bolded. In the full sample of 2003–2014 the high dividend yield stocks have higher returns on every sub-period except the ex-dividend day. High yield stocks have statistically significant negative abnormal returns on the ex-dividend day while low yield stocks have statistically significant positive returns. This reflects to the ex-dividend day stock price drop ratios where high yield stocks have ratios above 1 and low yield stocks have ratios below 1. The highest abnormal return during the ex-dividend period is found in the final sub-period 16–20 in the full sample and the high dividend yield group of the full sample with both observations being statistically significant.

**Table 22.** Sub-period abnormal returns.

| $(\tau_1, \tau_2)$ | –20––16 | –15––11 | –10––6 | –5––1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| –2004 High | 1,50% | –0,35% | –0,70% | 0,53% | **–0,94%** | –0,72% | 1,38% | 1,35% | 0,80% |
| –2004 Low | –1,49% | 0,78% | –1,29% | 1,16% | 0,74% | 0,25% | –0,80% | 0,09% | 0,70% |
| 2005–2008 High | 0,67% | **1,51%** | 1,00% | **1,93%** | 0,24% | –0,12% | 0,15% | –0,55% | 0,44% |
| 2005–2008 Low | 0,39% | 0,22% | 0,33% | 0,19% | 0,12% | –0,67% | –0,20% | **–0,70%** | 0,40% |
| 2009–2011 High | 0,21% | 0,40% | 0,39% | **–0,75%** | **–0,82%** | –1,40% | 0,80% | –0,25% | **2,15%** |
| 2009–2011 Low | 0,48% | 0,86% | 0,21% | 0,33% | **0,85%** | –1,00% | 0,07% | 0,76% | 0,66% |
| 2012–2014 High | 0,08% | 0,33% | –0,78% | 0,14% | –0,23% | –0,46% | –0,18% | 0,52% | 0,74% |
| 2012–2014 Low | 0,14% | –0,99% | –0,05% | 0,01% | 0,00% | –0,47% | –0,53% | 0,28% | –0,30% |
| 2003–2014 High | 0,56% | 0,59% | 0,19% | **0,61%** | **–0,34%** | **–0,55%** | 0,42% | 0,08% | **1,00%** |
| 2003–2014 Low | 0,18% | 0,16% | 0,00% | 0,24% | **0,31%** | **–0,70%** | –0,19% | –0,14% | 0,26% |
| 2003-2014 Total | 0,32% | 0,41% | 0,09% | **0,43%** | 0,02% | **-0,63%** | 0,05% | 0,03% | **0,66%** |

Six test statistics were used in the study each with strengths and weaknesses. $J_2$ was selected to detect the gradual effect of price pressure assumed to cause the ex-dividend period abnormal returns. The rank test static $J_4$ should have most difficulties detecting gradual returns expected to take place over time instead of a single large impact. In table 23 below a + denotes a rejected $H_0$ at 5% level and – denotes the test statistic was the only one rejecting or not rejecting $H_0$. The nonparametric tests failed to detect the final period abnormal returns and the BMP-statistics suffered from small sub-sample size. Otherwise the performance was reasonably consistent.

**Table 23.** Test statistic performance.

| $(\tau_1, \tau_2)$ | –20––16 | –15––11 | –10––6 | –5––1 | 0 | 1–5 | 6–10 | 11–15 | 16–20 |
|---|---|---|---|---|---|---|---|---|---|
| $J_1$ | | + | | + | +++++ | ++ | | | +++ |
| $J_{1BMP}$ | | ++– | | + | + | +++ | | | ++ |
| $J_2$ | | + | | +++ | +++++ | ++++ | | + | +++ |
| $J_{2BMP}$ | | + | | +++ | ++ | +++++ | | + | ++ |
| $J_3$ | | + | | + | +++ | +++++ | – | | |
| $J_4$ | | – | | ++ | +– | ++++ | | + | |

# 6. CONCLUSIONS

The research hypotheses for this thesis were:

$H_1$: *The stock price falls on ex-dividend day by an amount equal to the dividend.*

$H_2$: *Abnormal returns are zero during the ex-dividend period.*

The stock price falling by the amount it pays out seems quite reasonable at first. The analysis of ex-dividend day stock price drop ratio $\Delta P/D$ however revealed the ratio's dependence on dividend yield. Answering the research hypothesis $H_2$ requires therefore the $\Delta P/D$'s to be classified with respect to dividend yield. Only one group of yearly $\Delta P/D$ observations showed evidence against the research hypothesis $H_2$, the data from the first year of dividend partial double taxation, 2005. The $\Delta P/D$ was found to be less than 1 for both the adjusted and the unadjusted ratios even though both high and low yield stocks were analyzed together. No other year presented such results.

Two yield segments were found to have unadjusted $\Delta P/D$'s less than 1 and for the highest yield segment the adjusted $\Delta P/D$ was found to be larger than 1. More importantly the top yield decile had both adjusted and unadjusted $\Delta P/D$'s larger than 1. The full sample showed the unadjusted $\Delta P/D$ to be less than 1 and the lowest yield third had both adjusted and unadjusted $\Delta P/D$'s less than 1. Evidence supporting these findings was also found in the second part of the empirical study in the ex-dividend day abnormal returns. Low dividend yield stocks were found to have positive abnormal returns on the ex-dividend day whereas high yield stocks had negative abnormal returns corresponding to $\Delta P/D$ ratios of less than 1 and larger than 1 respectively. With two opposites there is bound to be a grey area in between and in this case the grey area is with the middle yield group and for this group the research hypothesis $H_1$ holds. For low yield and top yield stocks $H_1$ is rejected and $\Delta P/D$ is found to be different from 1.

Abnormal returns were detected in three 5-day sub-periods of the ex-dividend period in the full sample. The sub-periods –5—1 and 16–20 had positive abnormal returns and the 1–5 sub-period following the ex-dividend day had negative abnormal returns. The abnormal returns around the ex-day suggest investors prefer to buy stocks cum-dividend and sell them ex-dividend and the shift in supply and demand for stocks is a possible driving force behind the abnormal returns. One possible explanation for the final sub-period abnormal returns is the reinvestment of dividends. Dividends are paid on average within two weeks of the ex-dividend day and the abnormal returns are higher on high yield stocks.

Table 22 highlights the necessity to examine high and low dividend yield stocks separately. The average ex-dividend day abnormal return for the four time periods in the study is –0,04%. However the average difference in each time period's high and low yield ex-day abnormal returns is 0,87%. This is also observable from the full sample average ex-dividend day abnormal return of 0,02% and the statistically significant ex-day abnormal returns of opposite signs for the full sample high and low yield segments of –0,34% and 0,31% respectively. High yield stocks also fare better through the ex-dividend period. The buy-and-hold average abnormal return BHAAR for the high yield segment is 2,39% compared to the low yield segment's –0,21%.

There are differences in abnormal returns between the time periods. With 5,1% cumulative average abnormal return and all parametric test statistics well above the 1% significance level, the high yield stocks in 2005–2008 show strong preference for dividends prior to the ex-day. Similarly the 2009–2011 period high yield stocks have statistically significant negative abnormal return suggesting dividend aversion. The ex-dividend period also shows for low yield stocks cumulative average abnormal return 1,1% in 2005–2008 and 1,9% in 2009–2011 but not with statistical significance. Negative abnormal returns leading up to the ex-day during 2012–2014 suggest dividend aversion although not statistically significant. Considering the increasingly narrowing gap between dividend and capital gains taxation there is an argument for dividend aversion. As a conclusion to the thesis, this study rejects the research hypothesis $H_2$ and states that there are abnormal returns present in the ex-dividend period.

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